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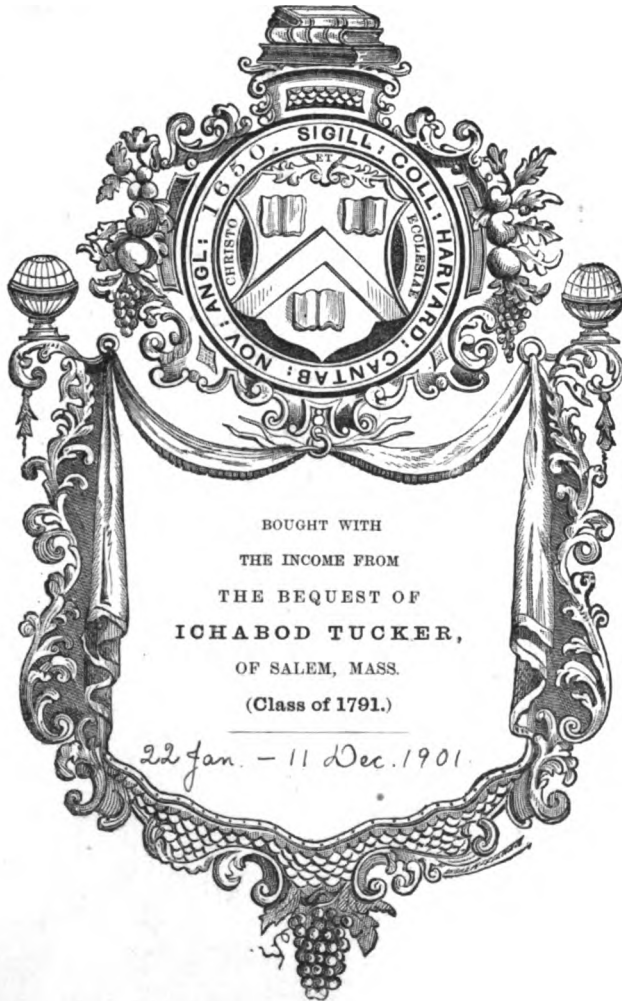
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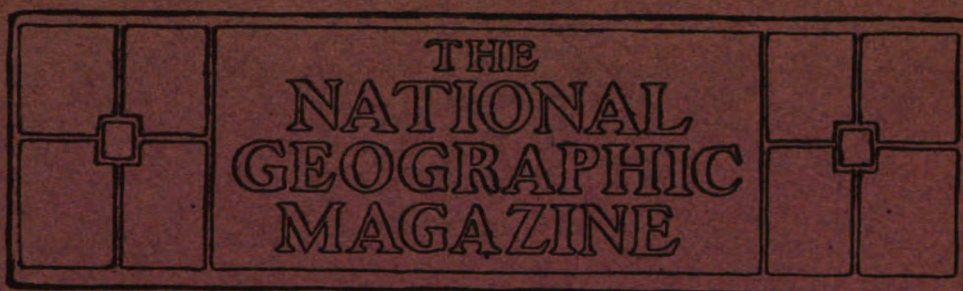
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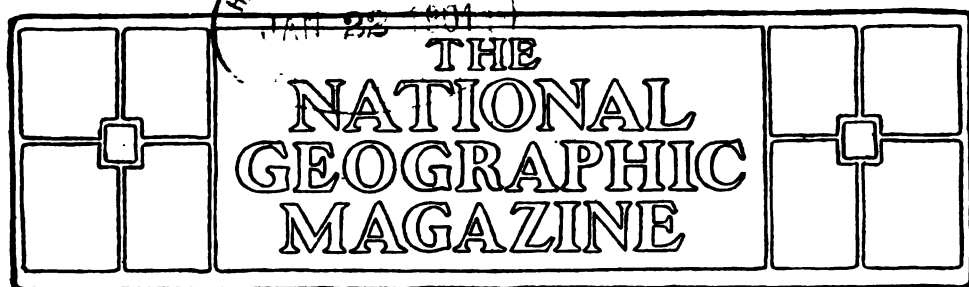
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THE INFLUENCE OF SUBMARINE CABLES UPON MILITARY AND NAVAL SUPREMACY

BY GEORGE O. SQUIER, CAPT. SIGNAL CORPS, U. S. A.

THE accidental non-delivery of two cable messages from the Minister of Marine (Bermejo) to the Commander-in-Chief of the Spanish Squadron (Cervera) at Martinique, undoubtedly largely changed the whole history of the Spanish-American War.

One of these telegrams informed him of coal supply near at hand, and the other granted him permission to return at once, with his squadron, to Spain.

Admiral Cervera's firm stand against the despatch of the Spanish squadron from the coast of Spain to West Indian waters is heroically and almost pathetically shown in the recent publication, by permission of the Queen Regent, of the official despatches. At Cape Verde, and before and after, by cable and by letter, he points out the unpreparedness of his squadron, and predicts its certain destruction if it proceeds. Knowing his strong views, it is probable that he would have lost no time in coaling and starting back to Spain.

With Cervera's squadron returned to Spain there would have been no Santiago campaign, the Flying Squadron would

probably have been sent to the coast of Spain, and the land operations in Cuba directed against Havana.

Cervera's fleet not eliminated, who can say how long Spain may not have been able to resist, and what additional blood and treasure the struggle may have cost the United States.

The story of the Spanish-American War is largely a story of "coal and cables." That war for the first time demonstrated the dominating influence of submarine cable communications in the conduct of a naval war. As a result of it the principal maritime powers, with colonial possessions, are each at present elaborating their "cable policy," and have awakened to a realization of the fact that reliable submarine communications under exclusive control are not only absolutely necessary, but exercise a dominating influence upon the control of the seas, whether in commercial strategy or in military and naval strategy.

A modern war between two naval powers has reduced itself largely to a war of "coal and cables."

At present the submarine telegraph is

a powerful instrument of war, more powerful, indeed, than battleships and cruisers, since by its wonderful and instantaneous communications of thought, it brings distant countries and colonies together in sympathy, which is the only true and permanent tie.

ELECTRICITY THE IDEAL MEANS OF TRANSMITTING INTELLIGENCE.

The triumphs of science in the last half century have been nowhere more exemplified than in the enormous strides made in the facility of transmitting intelligence. The mails, the telegraph, and the telephone are civilizing the world. Perfect as is the mail system of to-day, a monument to organization, yet its swiftest messenger—steam—is so far outstripped, either on land or sea, by the practically instantaneous electric current, that the tendency, year by year, is to put more of the world's business "upon the wire."

Time has an international money value in trade, and a paramount strategic value in war. The fastest mail express, or the swiftest ocean ship, are as naught compared with the velocity of the electrical impulse which practically annihilates any terrestrial dimension. As the distance increases, electricity surpasses steam in a continuously increasing ratio. A message is to be sent half way around the earth; the minutes required by the telegraph run into weeks and months by the slow process of the mails. Steam time is directly a function of the distance to be traversed, and from the nature of things is twice as long for two miles as for one. If, then, the cable saves six days between Europe and America, it will save more than twice this time between America and the East, and is, from this point of view, correspondingly important and necessary. Since electricity so far outstrips any other known vehicle for transmitting intelligence, it must eventually carry all the most important of the world's information.

Strategy has been defined as "the science of combining and employing the means which the different branches of the art of war afford, for the purpose of forming projects of operations and of directing great military or naval movements; the art of moving troops or ships so as to be enabled either to dispense with a battle or to deliver one with the greatest advantage and with the most decisive results."

It is believed that the more the foundations of successful strategy are analyzed, both as the science of conceiving military plans and as an art of executing the same, the more it will become clear that the strategist who is possessed of the most efficient and reliable means of obtaining and communicating information, both of the enemy and his own forces, will have a paramount and insuperable advantage.

Maritime nations are at present beginning to realize that it is not ships and coaling stations alone which measure maritime strength, but also reliable and efficient means of directing, concentrating, supplying, or withdrawing those ships upon the great chess-board of the sea.

As a means of communication over great distances at sea nothing compares, at the present state of practical science, with the submarine cable. The nation with exclusively controlled submarine communications, not possessed by an adversary, has an organized service of surveillance which is not only important during actual war, but which may and will prove a powerful weapon in the diplomatic and preparatory conflict which always precedes a declaration of war, and these communications are a means of securing a first *real* victory, even before war has been formally declared.

It may be said, therefore, *that the very foundation of successful naval strategy is efficient and exclusively controlled communications, and the lack of them more serious than inferior ships.*

THE IMPERIAL CABLE SYSTEM OF GREAT BRITAIN.

As soon as the possibility of communicating at long distance, by means of submarine cables, was practically demonstrated, England saw what commercial and political preponderance the creation of a great network of cables, resting under her control, would give her. Without letting herself be discouraged by heavy losses in the beginning, with a perseverance worthy of admiration, she has succeeded in creating and developing, methodically and without delay, a network of submarine telegraphic cables, which to-day encircles a large part of the entire world.

The English cables, up to the present, have been laid principally by private companies, but Article 7 of the conditions which govern them provides that all official despatches shall have precedence over others; Article 3, that the companies can have no foreigners among their employees, nor can the wires pass into a foreign office, nor under the control of a foreign government; and Article 9, that in case of war the government can occupy the different stations and place its own employees therein.

During the past two years, however, there has been a great national protest in England and the colonies against the exorbitant rates imposed by the monopoly of the private cable corporations, until the principle of absolute state ownership has come to be a controlling one in England's future cable policy.

England's sea-power is not alone measured by the number, character, and tonnage of her war-ships. It is immensely increased by the system of exclusively controlled submarine cable network, which at present forms four-fifths of all the cables in the world, woven like a spider's web to include all her principal colonies, fortified ports, and coaling stations.

Submarine cable communication is

scarcely fifty years old, yet the British Empire is already bound together in one vast intelligence, transmission system, with London as its centre. Nothing important can happen in any quarter of the globe which does not find its way to this great world's news exchange—London. And this system is and has been a principal element of her strength and has largely made possible a government including subjects naturally widely differing in character, habits, and modes of thought.

This great cable system is the more important since no other country has such a system, and this fact has placed in the hands of the British Empire a powerful means of real dominion over the rest of the world. Nor is England satisfied with her present extensive telegraph system of world control; she has in projection for the very near future an extension of this system, which will be nothing less than a British imperial telegraph system encircling the entire globe.

It was early discovered by every country in Europe that so efficient and valuable a servant to trade and commerce, so important an aid to the state itself as the telegraph, should become a national institution. Great Britain, France, Austria, Prussia, Russia, Sardinia, Italy, Spain, Portugal, and Belgium, each established a state telegraph system. Thirty years ago the English telegraph lines were transferred to the state, and experience has shown that this has been done with advantage to the state itself and to the benefit of the public. At the present moment the British Empire is advancing rapidly to the accomplishment of a state controlled cable system. Imperial penny-postage having been recently realized throughout the British Empire, the next great step in imperial development along this line is to connect the state-owned land telegraph systems of the Empire by a state-owned and controlled system of submarine cables.

An essential and necessary condition

which has guided in the conception and realization of this cable system has been that none of the lines shall touch foreign soil. So important has been this principle in the proposed British-Pacific cable that we find Great Britain, for some years past, anxiously negotiating for sovereignty over an insignificant island in the Hawaiian group upon which to land her proposed cable to Australasia; and, failing in this, we find her boldly ready to lay a single span of cable of over 3,500 nautical miles in length from Vancouver to Fanning Island, for the sole imperial reason that the cable shall touch only soil exclusively owned and controlled by Great Britain. This principle will be bought in this case at the price of permanently placing at a disadvantage British cable traffic in the Pacific; since, as will be pointed out later, the United States, by the annexation of the Hawaiian Islands, can reach the East across the mid-Pacific by cables having no single span longer than the present Atlantic cables, and yet adhere to the same principle of landing only on territory belonging to the United States.

BRITISH-PACIFIC CABLE.

England at present has direct telegraphic connection with Vancouver with wires independent of any foreign power. Practically all of the Atlantic cables landing at Newfoundland or Nova Scotia from the coast of Ireland are under British control, and, in connection with the Canadian Pacific telegraphic lines, therefore furnish England with direct communication to the west coast of North America.

The proposed British-Pacific cable has been prominently before the British Government as an imperial measure for a number of years. It has been the subject of colonial conferences and of exhaustive research by a Pacific Cable Commission. Its construction is now assured beyond a reasonable doubt. The route from Vancouver is to Fanning Island, thence

to Fiji Island, thence to Norfolk Island, and from thence by two branches to New Zealand, and the eastern coast of Australia. The land lines of Australia would then complete telegraph connection with the western coast.

In the Indian Ocean it is proposed to connect West Australia to Cocos Island, and thence to Mauritius, and from thence to Natal and Cape Town. Cocos Island is further to be connected with Singapore by a branch cable. Singapore is already in connection with Hong Kong by an all-British cable. Another branch is also proposed from Cocos Island to Ceylon. At Mauritius a connection would be formed with the existing cable at Seychelles, Aden, and Bombay. In the Atlantic Ocean, in order to avoid the shallow seas along the west coast of Africa, Spain, Portugal, and France, a cable from Cape Town, touching at St. Helena, Ascension, and mid-ocean stations, and extending to Bathurst, which is already connected by existing cables to Gibraltar, has been laid within the last few months. Its construction was hastened after the outbreak of the Boer war to furnish an alternate British route to South Africa by the West Coast. It is further proposed to extend the cable from Ascension to the British Island of Bermuda, perhaps touching at Barbados as a mid-ocean station. At Bermuda a connection would be formed with the cable already existing at Halifax, and that point with the Canadian and trans-Atlantic lines. The extension of the above cables in the Pacific, the Indian, and the Atlantic oceans would involve the expenditure of something like £6,000,000 sterling and the laying of about 23,000 knots of new cable. With the equipment and experience which Great Britain has had in cable-laying, these new cables can be manufactured and laid by England in an incredibly short time, and there can be little doubt but that this extension of British cables, if not along the exact line above specified, yet with slight variations

will be an accomplishment of the near future.

With this extension of imperial cable added to her already extensive state-owned land-line system, England will have the most complete telegraphic system in existence, placing the following fortified and garrisoned coaling stations in direct connection each with any other, viz.: Hong Kong, Singapore, Trincomalee, Colombo, Aden, Cape Town, Simons Bay, St. Helena, Ascension, Saint Lucia, Jamaica, Bermuda, Halifax, Esquimalt, King George's Sound, and Thursday Island. The following "defended ports" would likewise be connected, viz.: Durban, Karachi, Bombay, Madras, Calcutta, Rangoon, Adelaide, Melbourne, Hobart, Sydney, Newcastle, Brisbane, Townsville, Auckland, Wellington, Lyttelton, and Dunedin.

With the completion of the cable across the Pacific the last telegraphic gap will be completed around the earth. Great Britain will then have the great advantage of duplicate routes, since from any point there will be two routes—one east and one west—to any other station.

PROPOSED COLONIAL TELEGRAPH SYSTEM FOR THE UNITED STATES

Since the events of the Spanish-American War the supreme importance of exclusively controlled communications, as a means of military and naval warfare, has been recognized as never before. All the principal nations are studying this subject in its various aspects, and already a distinct cable policy is entering into the politics of the principal countries possessing colonies and seeking for commercial, military, and naval supremacy.

In this connection it may be of interest to note briefly what has been the telegraph policy of the United States in dealing with the territory of our new possessions. In Cuba and Porto Rico, and in the Philippine Archipelago, every effort has been made by the Signal Corps

of the Army to cover the islands with a network of wires, so complete and reliable that intercommunication is insured at all times. In the pacification of Cuba and Porto Rico, in the suppression of the Philippine uprising, it is believed that there has been no more potent agent than the military telegraph.

For years Spain had been trying to pacify the Island of Cuba, and yet her telegraph system was incomplete, obsolete, and unreliable in the extreme. It was possible for bands of insurgents to move about much at their pleasure, appearing here and there, with no means of locating or concentrating for their destruction. It was not that the number of troops was not sufficient, so much as that there were no efficient means of directing the troops in such a way as to make results decisive.

TELEGRAPH SYSTEM IN CUBA AND PORTO RICO.

Since the evacuation of Cuba by Spanish troops the land telegraph system has been entirely reconstructed by the United States Signal Corps, and now aggregates about 2,500 miles, including a central trunk line the entire length of the island, which is duplicated from Havana to Sancti Spiritus. In addition to this trunk line there are thirteen lines across the island, which divide it up into comparatively small sections. Every mile of these lines has been reconstructed, under great difficulties, yet their reliability is evidenced by the fact that the entire Porto Rican Government business, which is now transmitted over the new land lines from Havana to Santiago, was conducted during the month of June, 1900, without a single interruption.

In the Island of Porto Rico every important commercial or military point is in telegraph connection by a system of lines, which have also been entirely reconstructed and the routes improved since the disastrous hurricane of August, 1899.

PHILIPPINE MILITARY TELEGRAPH SYSTEM.

It has been assumed as a principle from the outset that the quickest means of pacifying and civilizing the Philippine Archipelago is to cover it with a network of telegraph wires. Commanding officers can crush an incipient uprising suddenly and before it has time to assume dangerous proportions by concentrating by telegraph the garrisons from all directions upon the one point involved. Already there are about 2,500 miles of land telegraph lines in operation in the Philippines, and about two hundred and sixty miles of inter-island and lake cables have been laid, every mile constructed by the United States Signal Corps since the battle of Manila Bay. At the last report the telegraphic messages in the Island of Luzon alone exceeded 6,500 per day, averaging over forty words each, or approximately 260,000 words daily.

It may be added that the telegraph is practically the only mail service that exists.

In Luzon two trunk lines have been established—one along the west coast, the other along the Rio Grande de Cagayan. The islands of Cebu and Leyte have been connected by cable, and a complete new route from Manila to Iloilo is in operation, furnishing a duplicate route to the present English cable direct from Manila to Iloilo. In the Department of Mindanao and Jolo, the plan involves direct communication, by cable, between the principal islands, and by land lines and cable to the telegraph system in the Department of the Visayas, and from thence, by duplicate routes to Manila.

THE ALASKAN TELEGRAPH SYSTEM.

The growing commercial importance of Alaska, and the prospective future of that country, have made the construction of a telegraph system for this territory an imperative necessity. Congress at its last session authorized an expenditure of

\$450,000 for the construction of such a line.

Owing to the shortness of the working season in this latitude, and the very unusual conditions under which the line must be constructed, as well as the lack of any adequate transportation, it was not hoped to complete the work this season.

The military cables connecting the gold district of Cape Nome with the Headquarters at St. Michael, and also connecting St. Michael with Unalaklik, which is to be the terminus of the land line up the Yukon, have been completed and have placed the Department Commander at St. Michael in direct communication with Cape Nome.

These submarine cables, involving in the aggregate nearly two hundred miles, were constructed by an American manufacturer, and were laid, equipped, and operated by American engineers.

The military forts to be connected, with the approximate distances, are shown in the following table:

	Valdez.	Fort Egbert.	Circle City.	Fort Yukon.	Rampart.	Fort Gibbon.	St. Michael.
Fort Egbert ..	350						
Circle City ..	520	170					
Fort Yukon...	610	260	90				
Rampart	870	520	350	260			
Fort Gibbon...	940	590	420	330	70		
St. Michael...	1,490	1,140	970	880	620	550	
Cape Nome ..	1,610	1,260	1,090	1,000	740	670	120

By a recent temporary arrangement with the Canadian authorities this telegraph system will be enabled to reach the United States over the line now being constructed by the Canadian Government between Atlin and Quesnelle—a distance of about nine hundred miles.

A PACIFIC CABLE.

In order to bind together the local land telegraph systems which have been outlined above, these systems should be directly connected at an early date with the United States. First in this colonial system, comes the proposed trans-Pacific Cable, connecting California with the Hawaiian Islands, thence to Midway

Island, thence to the Island of Guam, and from there to the Island of Luzon.

A cable system from Vancouver via the Aleutian Islands to Japan and the Philippines has long been proposed, and has many points, commercial and technical, in its favor as a trans-Pacific route. The true solution is thought to be the early construction of both of these trans-Pacific cable lines, thereby furnishing, first, a direct connection to the Alaskan system, and by a later extension to the Philippines a duplicate route for the protection of the more southern line via Hawaii. A short cable from Sitka to Valdez would be one means of perfecting a junction with the Alaska land system.

The recent acquisition by the United States of the island of Tutuila, and the construction in Pago Pago Harbor of a coaling station, makes it desirable to join this advanced American station in the southwestern Pacific to the Hawaiian Islands by submarine cable.

This can probably be most readily accomplished by connecting it directly to Fiji, a station on the British-Pacific cable route.

To further complete this proposed colonial telegraph system, it will be necessary to connect the island of Porto Rico by submarine cable to the United States, and, although of greater length, a line direct from New York to Porto Rico is suggested as offering many advantages. The shortest line is not always the most advantageous. For instance, Haiti is connected direct to New York City, instead of to the coast of Florida, which would be much nearer, and Bermuda is connected direct with Halifax, for the sole object of exclusive British control under all circumstances.

ESTIMATED COST OF PROPOSED COLONIAL TELEGRAPH SYSTEM.

CABLES IN THE PACIFIC.

Trans-Pacific cable, San Francisco via Hawaiian Islands, Midway Island, and Island of Guam to Luzon	\$12,000,000
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Inter-island communication for the Hawaiian group	\$150,000
To complete the Inter-island telegraph system of the Philippines..	250,000
For Alaska telegraph system, as already authorized by Congress ...	450,000
To extend the Alaska telegraph system and to connect it to the United States by direct cables, and also for further extension to the Philippines via the Aleutian Islands, providing a duplicate trans-Pacific route to the Philippines	10,000,000
For cable connections with Tutuila Island coaling station at Pago Pago Harbor	650,000

CABLES IN THE ATLANTIC.

Direct cable from the coast of the United States to the island of Porto Rico	1,500,000
Total	\$25,000,000

Estimated cost of proposed Isthmian Canal	\$200,000,000
Relative cost of two enterprises.....	1 to 8

This estimate, which is necessarily a very general one, due to the great fluctuations in the price of materials, the inexperience of American manufacturers, etc., shows that with an expenditure of \$25,000,000, or perhaps \$30,000,000 at most, the United States can have a telegraph system connecting all her possessions, and placing each part of such possessions in direct connection with the United States by the best and most efficient means of communication known.

For the expense of three or four first-class battleships, the United States can provide herself with the most powerful means known for extending and preserving her commercial influence and for the speedy pacification and civilization of the people who have recently come under her control, and can secure a strategic advantage—military, naval, and political—which is necessary to her position as a world power.

Submarine cables are now established for colonial, political, and diplomatic reasons, as really as for their purely commercial purposes. Nor is actual state of war of the country itself the only fear; witness the present plight of France due

to the Transvaal War; owing to the fact that the cables to South Africa are under the control of England, and the establishment by her of a war censorship, France is absolutely dependent upon England not only for news from the Transvaal, but also for communication with her own colony of Madagascar, and her South Africa possessions. The importance of this subject has led her Colonial Commission to recommend recently the immediate construction of submarine cables, joining France with Senegal, Madagascar, and Tonkin, the latter connecting with the Danish company's cables. Indeed, the plan ultimately involves an estimated expenditure of \$25,000,000 and includes a complete colonial cable system.

THE MILITARY CONTROL OF SUBMARINE CABLES IN TIME OF WAR.

The International Convention for the Protection of Submarine Cables, which met at Paris in 1884, made no provision defining the rights and immunities of cable property in time of war.

In addition to incorporating an article in the convention stipulating that this convention shall in no wise affect the liberty of belligerents, Lord Lyons, the British delegate, submitted the following declaration at the moment of signing the convention: "Her Majesty's Government understands Article XV in this sense, that in time of war, a belligerent, a signatory of the convention, shall be free to act in regard to submarine cables, as if the convention did not exist."

M. Leopold Orben, in the name of the Belgian Government, also submitted the following declaration:

"The Belgian Government, through its delegates to the conference, has maintained that the convention has no effect upon the rights of belligerent powers. Those rights would be neither more or less extensive after the signature than they are now. The mention inserted in Article XV, although absolutely useless in the opinion of the Belgian Govern-

ment, would not, however, justify a refusal on its part to unite in a work the expediency of which is indisputable."

Before the Spanish-American War there were few examples of damages done to submarine cables by belligerents.

As has been pointed out, Article XV of the Convention of Paris, of 1884, for the Protection of Submarine Cables, subscribed to by twenty-six nations, specifically states that "The stipulations of this convention shall in no wise affect the liberty of belligerents." In consequence, the question as to what, if any, special protection was to be accorded submarine cables in time of war, remained theoretical until the Spanish-American War of 1898, when a practical rule of action was outlined by General A. W. Greely, Chief Signal Officer of the United States Army.

Upon the declaration of war, General Greely, upon whom by law devolved the operation of military telegraph lines and cables, was called into the national council for his opinion as to the line of action best calculated to subserve the legitimate rights of commerce and industry, while conserving the military interests of the United States. He took the view that, inasmuch as postal communications were forbidden between belligerents, prohibitive orders should be issued against such telegraphic correspondence as might benefit the public enemy, pointing out that telegrams, by their secrecy and rapidity, produce military results much more important and injurious than are possible by the use of the mail.

General Greely advised that cable operations should continue over the international cables between Havana and Florida, of course under strict military censorship, and his firm stand prevented any interruptions of this cable system. By his orders Captain R. E. Thompson, Signal Corps, United States Army, took military possession of the Key West telegraph office on April 23, 1898, and cut the cables so that Jacksonville could no longer work with Havana. Domestic and

business messages in open text were allowed to be sent and received from Havana, but only under strict military censorship. Similar action was taken at Havana by the Governor-General of Cuba, who established a rigid Spanish military censorship, so that all messages were subject to double scrutiny.

By his instructions General Greely recognized the existence of five classes of cables:

First: Those of which the termini are in the enemy's country; for instance, the Cuba Submarine Cable system along the south coast of Cuba.

Second: Cables which directly connect countries at war, so that each belligerent controls one end of cable; for instance, that of the International Oceanic Telegraph Company between Florida and Havana.

Third: Where one end of the cable is in the enemy's country and the other in neutral territory; for instance, the West India and Panama cables extending through Cuba to Porto Rico, and thence to Saint Thomas.

Fourth: Where a cable extends from the coast of an offensive belligerent to a neutral country contiguous to the territory of the defensive belligerent; for instance, the Haiti Cable from New York City to Haiti, where there is direct cable connection with the Island of Cuba.

Fifth: Cables having one terminus in the territory of the offensive belligerent and the other in neutral regions remote from the scene of hostility; for instance, the Atlantic cables connecting the United States with Europe.

To cables of the first class, whether the property of the defending enemy or a neutral corporation, was applied the simple and well-known rule that they are subject to the vicissitudes of war, and that being in use for war purposes they are proper objects of offensive military operations. The orders issued to the officers of the Signal Corps looked upon these cables, whether they were laid in

the high sea or along the immediate coast, as liable to seizure and total destruction.

Cables of the second class were easily dealt with. The cables between Key West and Havana were taken possession of, militarily, by Spain in Cuba and by the American Army in Key West. Messages going and coming were subjected to the most rigid military censorship at both ends of the cable. Only messages in plain text bearing upon business and social subjects were permitted, and where any suspicion existed as to the loyalty of the sender were either refused or not sent. Exceptional cipher messages were permitted as a matter of courtesy and favor to selected diplomatic representatives of neutral nations.

The cables of the third class were viewed as contraband of war; but it was also recognized that their liability to destruction depended in a measure on the locality of the cable. General Greely recognized as unsettled and of doubtful expediency the right of any belligerent to raise from the bottom and destroy on the high sea a neutral cable, merely on the ground that such cable landed in a hostile country. He, however, applied a more rigid rule to such portions of cables, cable huts, instruments, etc., as were located within the territorial jurisdiction of the enemy. This rule was based on the principle that such cable property, whether belonging to an enemy or to neutral corporations, is not only subject to the vicissitudes of war, but, being contraband of war, is a legitimate object of military operations. In accordance with this view his orders to Colonel James Allen, Signal Corps, charged him to use his utmost efforts to cut off the south coast of Cuba any cable that could be grappled and picked up, either within a marine league of the coast, or within range of Spanish batteries.

In Cuba and Porto Rico, during the Spanish-American War, certain neutral cable stations of this class fell within the

power of the Army of the United States. In such cases the officials of the neutral cable companies were given a choice of action. They could abandon their property to the vicissitudes of war, or accepting the *force majeure*, were allowed to transact business under strict military censorship. Even during the siege of Santiago the orders permitted the French Telegraphic Cable Company to accept business for Santiago de Cuba within the Spanish lines, every such message, however, to be viséd by the military censor.

The fourth class of cables were seized by the military forces of the United States and operated under strict military censorship. Code and cipher messages were absolutely refused save for the authorized government agents and certain excepted diplomatic representatives, the latter as a matter of courtesy.

Cables of the fifth class were placed under a military censorship. Of these, there were six systems comprising separate cables. Most of these telegraph cables were only constructively seized, General Greely taking the responsibility of intrusting the direct censorship of messages, under the general supervision of an officer of the Signal Corps, to the respective superintendents, men of high character, whose good faith was guaranteed by the companies whose interests they likewise guarded. The interests of the United States were thus subserved while the privacy of the affairs of the companies was conserved. The responsible officials gave a written pledge to observe such rules as might be filed by the Chief Signal Officer with the companies. These rules prohibited all messages to and from Spain, and also certain other classes which were deemed prejudicial to the military interests of the United States. In cases of doubt, messages of the latter character were examined and viséd by the military censor.

The events of the Spanish-American War brought to attention the whole subject of the legal rights of cable property

and the control of the same under varying and complex conditions in time of war. In the absence of definite international law upon the many points involved, the United States was forced to take the initiative and use this powerful military weapon for the benefit of the cause of the United States, while at the same time respecting and subserving the rights of neutrals with an equity and fairness which has always characterized the actions of this Government when possible.

In the West Indian cables, as well as in the cable connecting the Philippines with Asia, the cable question was always a paramount one, and the United States finds herself now confronted with legal questions, growing out of actions necessary in time of war. Since submarine cables have become such a dominant influence in time of war, and since the cases which may naturally arise are often complex and involved, it is clear that a further international cable conference is a necessity of the near future, by which a more definite international understanding of methods of procedure in time of war may be attained. This international conference could properly consider other international cable matters, which the great advance in submarine telegraphy has made important. Among these may be mentioned the construction and authorization of a uniform international cable code, for the economical and efficient communication between different parts of the world in any of the principal languages now authorized by the international telegraph rules.

THE CABLE EQUIPMENT OF A FLEET.

It seems clear from the history of the Spanish-American War that provisions must be made for laying, picking up, cutting, and operating submarine cables in time of war. From the outbreak of this war every attention was given to the problem of isolating the island of Cuba from Spain.

The special fitting out of the *Adria* with cable appliances, as well as spare cable, the work of the *St. Louis* in cutting cables, the operations of the *Marblehead*, *Nashville*, and *Windom* at Cienfuegos, and of the *Mangrove*, are too well known to be repeated here. It will be more valuable to endeavor to draw the correct conclusion from these operations, and thereby make proper provision for the execution of similar operations in time of war.

It appears that the searching for deep-sea cables in the high seas in time of war, without an accurate chart of the location of the cable, is a difficult and very doubtful operation; also that submarine cables must in general be interrupted near their landing places, where their exact location can be determined with certainty. From the experience of the Spanish-American War, operations of this kind are extremely dangerous, as the cable landing will be protected and defended by the enemy.

Supply of spare cable and suitable instruments for working the same must be available with every naval fleet—in order to supply the necessary communications with the shore, in case of the landing of either a coöperating army, or of temporary forces from the ships. Cable-ships engaged in either laying, cutting, or repairing cable near the shore, must either be provided with their own means of defence, or else convoyed by war-ships.

These facts make it clear that a new type of naval ship is to make its appearance as a necessary adjunct to every naval fleet. Just as the naval repair-ship, such as the *Vulcan*, has been found useful and necessary, so will the new cable cruiser be an essential part of the navy of the near future. It is not intended here to enter into the question of the proper design of such ships, but it would seem that a specially designed cable-ship, with comparatively large coal capacity and high speed, and an armament of the lighter cruiser class, making her capable of defending herself and protecting her

small-boat parties, would be best adapted for the purpose. She must carry a moderate supply of spare cable and machinery for laying and picking up cable, as well as instruments for testing and operating a cable, and the necessary buoys, suitable, if necessary, for buoying the cable, and operating the ship as a floating cable station. It is unnecessary to state, also, that her personnel must be specially trained in the highly technical duties required, and from actual practice in all the operations necessary, be made ready for the performance of their duties efficiently under the conditions of war.

Although these naval cable cruisers in time of peace could be profitably employed in maintaining and repairing both cables belonging exclusively to the government, and those subsidized by the government, under suitable arrangements, yet, at the outbreak of war they should be absolutely and exclusively under the control of the government. It may be said at present that no modern fleet is complete without a cable-ship, especially adapted for cable operations in time of war.

Since submarine cables are so important a factor in national defence, they should be protected both at their shore landings and on the high seas by military and naval force.

In this connection it would seem advisable in case of government cables, or of cables subsidized by the government, to keep the exact route of important cables a secret, and prevent the publication of maps for general distribution, showing their exact location in the deep sea. The location of the shore ends, however, is certain to be known.

A cable landing, for the future, should partake of the character of a fort, and be provided with adequate means for preventing an enemy from locating and destroying the cable within the marine league, or, until it has reached deep sea, where its accurate location is not known.

The sea is usually considered as the great international highway, belonging equally to all nations; this, however, is no longer true. The real political boundaries of states are no longer defined and restricted by the land, but involve such portions of the high seas as a nation can, by her commercial and naval vessels, and her submarine cables, reach out and secure. In this great sea division, which is so surely taking place, probably there are no better guides to boundaries than the submarine cable net-works which lie in its great depths. Since each in general uses the shortest path between two points, the general commercial sailing lines are also the general direction of cable lines.

The United States will be wise if, in the great Pacific where she has such para-

mount natural advantages, both for commerce and for maritime strength, she pursues a broad, vigorous, and even lavish "cable policy." We should be able at the earliest date to manufacture upon American soil deep-sea cables of the first class; be able to lay, maintain, and repair them in time of peace or war by ships flying the American flag, and be prepared to adequately protect them upon the high seas, and at their landing places by military and naval force.

The cable question is one of the most important of the present hour, unique in that American commerce, diplomacy, and sea-power—in fact the most efficient means of advancing and securing the benefits of civilization itself—happily conspire in demanding its early solution.

THE INDIAN TRIBES OF SOUTHERN PATAGONIA, TIERRA DEL FUEGO, AND THE ADJOINING ISLANDS

BY J. B. HATCHER

Carnegie Museum, Pittsburg

IT is the purpose of this paper to record some observations made by the writer among the Indian tribes of Southern South America, during the three years of exploration conducted by him in that region in behalf of Princeton University. The country occupied by the people under discussion embraces that part of South America lying beyond the forty-sixth parallel of south latitude, including the mainland and the adjoining islands as far south as Cape Horn. The people living in this region belong to four distinct tribes, each inhabiting a certain limited area and differing from the others in language, customs, physical development, and especially in the activities nec-

essary to, and the mechanical appliances employed in, the gaining of a livelihood.

Owing to the natural barriers to social or commercial intercourse, presented by the topography of the region, communication between the different tribes is now and always has been extremely limited. This long period of comparative isolation has, with one exception, permitted each tribe to remain practically uninfluenced by the others, and has doubtless contributed to produce those linguistic and sociological features at present so distinctive of each.

Commencing with the mainland we shall first consider the Tehuelches, that so-called race of giants, made famous

by the exaggerated accounts of them brought home by the earliest travellers from Magellan's time to the beginning of the present century. Of splendid physique, they are abundantly able to withstand the rigorous climate of the bleak, treeless plains of Eastern Patagonia, where they live and find ample sustenance and wholesome employment in the pursuit and capture of the guanaco and rhea; both of which are extremely abundant throughout the entire extent of this region.

As a people, though not the race of giants they were commonly reported to be by most early writers, the Tehuelches are, nevertheless, decidedly above the average size. Of the three hundred Tehuelches living between the Santa Cruz River and the Strait of Magellan, I should place the average height of the men at not less than five feet eleven inches, with an average weight of one hundred and seventy-five pounds. While the fully grown women (those above twenty-four years of age) I should estimate at five feet seven inches, and of an average weight of but little, if any, short of that of the men. This lack of disparity between the physical development of the sexes is paralleled also in their mental development. It is noteworthy, and is due very largely to the division of labor among them. The labor necessary for the support of the family is more equally divided between husband and wife, among the Tehuelches, than is common with the Indian tribes of North America.

That these Indians are muscular and well proportioned, is seen by a glance at the illustrations accompanying this paper. There is a tendency to obesity rather than angularity. Conscious of their physical strength, like most persons of great physique even among the more civilized nations, they exhibit a kindly manner and gentle disposition. Accustomed to the free life of the plains, and living in the midst of an abundance of those animals

that for centuries have supplied all their simple wants, they display that homely hospitality so characteristic of well-fed and well-clothed savage and semi-civilized people in sparsely settled countries. The frank, open countenance of the Tehuelche at once allays any uneasiness and establishes a feeling of confidence in the mind of the solitary traveller who, in the course of his lonely wanderings throughout Patagonia may, by chance or necessity, be thrown among them.

The Tehuelches were formerly a considerably more numerous people than at present, though it is hardly possible that they at any time numbered more than 5,000. It is doubtful if there are more than five hundred of them remaining in all Patagonia, and this small number is being rapidly reduced by diseases introduced among them through contact with the whites. That they are not a prolific people is strikingly evidenced by the small number of children common to pure-bred Tehuelche families. In cases where both parents were of pure Tehuelche stock, I do not remember to have seen more than three children in any one family, while one or two were much more generally the number, and frequently there were families with no children. On the other hand in those families where a Tehuelche woman was married to a husband of Spanish, French, or Portuguese descent, such unions were, as a rule, ordinarily productive of offspring, there being frequently six or seven children to the family.

Firearms are quite unknown among the southern Tehuelches. They rely entirely upon their skill with the bolas, aided by their horses and dogs, for the capture of the guanaco and rhea, from which they derive not only their chief sustenance, but also the skins employed in the construction of their clothing, bedding, and tents or toldos. Formerly they used the bow and arrow, but with the introduction of the horse at the advent of the Spaniard, the bola entirely supplanted the bow and

arrow, and at present the latter weapon is no longer seen among them.

The changes wrought upon the Tehuelches by the advent of the horse, is a subject well worthy of the attention of the anthropologist. To this professional capacity I lay no claim, but I wish to mention some observations made by myself bearing directly upon this subject. Not only was the advent of the horse the determining factor in supplanting the bow and arrow by the bola among these Indians, but the introduction of that useful animal produced other most decided changes in the life and habits of the Tehuelches. Prior to the introduction of the horse they were dependent upon the bow and arrow not only for securing their food and clothing, but also for protecting themselves from the more numerous and warlike Indians who inhabited the country to the north, and with whom they were constantly at war. Greatly outnumbered by a deadly enemy and deprived of any rapid means of escape if attacked by a superior force, their favorite camping places were then chosen with reference to concealment and defence, quite as much as, or even more than, for their convenience to natural food supplies. In those pre-equine days, if I may use the term, the Tehuelche was wont to select for his encampment a secluded place in the bottom of some deep basalt cañon, adjacent to a stream or small spring, or if living on one of the larger rivers, the encampment would be situated not in a conspicuous place in the bottom of the valley, convenient to an abundance of grass and water, as at present, but would be hidden away in some bend of the stream or placed high up among the débris of basaltic rocks that encumber the slopes of most of the more important streams of the Patagonian plains. In such positions their low, box-like toldos, made of guanaco skins of a dull brown color, would not be easily detected.

Many such old camping places may now be seen, strewn with pieces of broken

pottery, worn out and discarded stone scrapers, stone chippings, arrow points, drills, mortars, etc. A site of one of these old-time Indian villages I examined very carefully. The bottom of the cañon bears unmistakable evidence of having been long used as a favorite camping ground of the Tehuelches. The soil over a considerable area is literally filled and covered with stone chippings, scrapers, broken pottery, broken and charred fragments of bones of mammals, birds and fishes, the latter taken from the stream which still flows between the village site and the high bluff beyond.

At this place I picked up about two hundred arrow points and drills, most of them imperfect, but did not find a single bola. Is it not possible that the introduction of the horse brought about the abolition of the bow and arrow and the adoption of the bola as a weapon of offence and defence? The bola, considering the limit of its effective range, and the time necessarily consumed in attaining a sufficient impetus before discharging it, certainly does not appear to be especially well adapted for the capture, by a man on foot, of animals possessed of such speed and endurance as are the guanaco and rhea. Whether the bola was in use among these Indians prior to the advent of the horse, can perhaps never be definitely determined, but there can be little doubt that as an implement for the capture of game, it came into far more general use after the introduction of the horse, when it began gradually to displace the bow and arrow, finally resulting in the total disappearance of the latter weapon. Throughout my travels in Patagonia I was struck by the almost total absence of bola stones about the old village sites, where arrow points were as a rule found in unusual abundance. The place just referred to was evidently long occupied as a favorite encampment. That it has been long abandoned is evident from the fact that over considerable areas implement-bearing strata are buried beneath several feet

of æolian drift materials. Moreover, the locality is one absolutely unfitted as a camping place for the present Indians, ac-

The coming of the Spaniard among the Tehuelches has resulted in the disappearance of still other implements than



Channel Indians of the West Coast and Western Part of Strait of Magellan.

companied as each band invariably is by several hundred horses, thus necessitating the selection of a site near abundant grazing lands.

the bow and arrow. Scattered about the old village sites are numerous pieces of broken pottery, though the manufacture of pottery is now a lost art with the

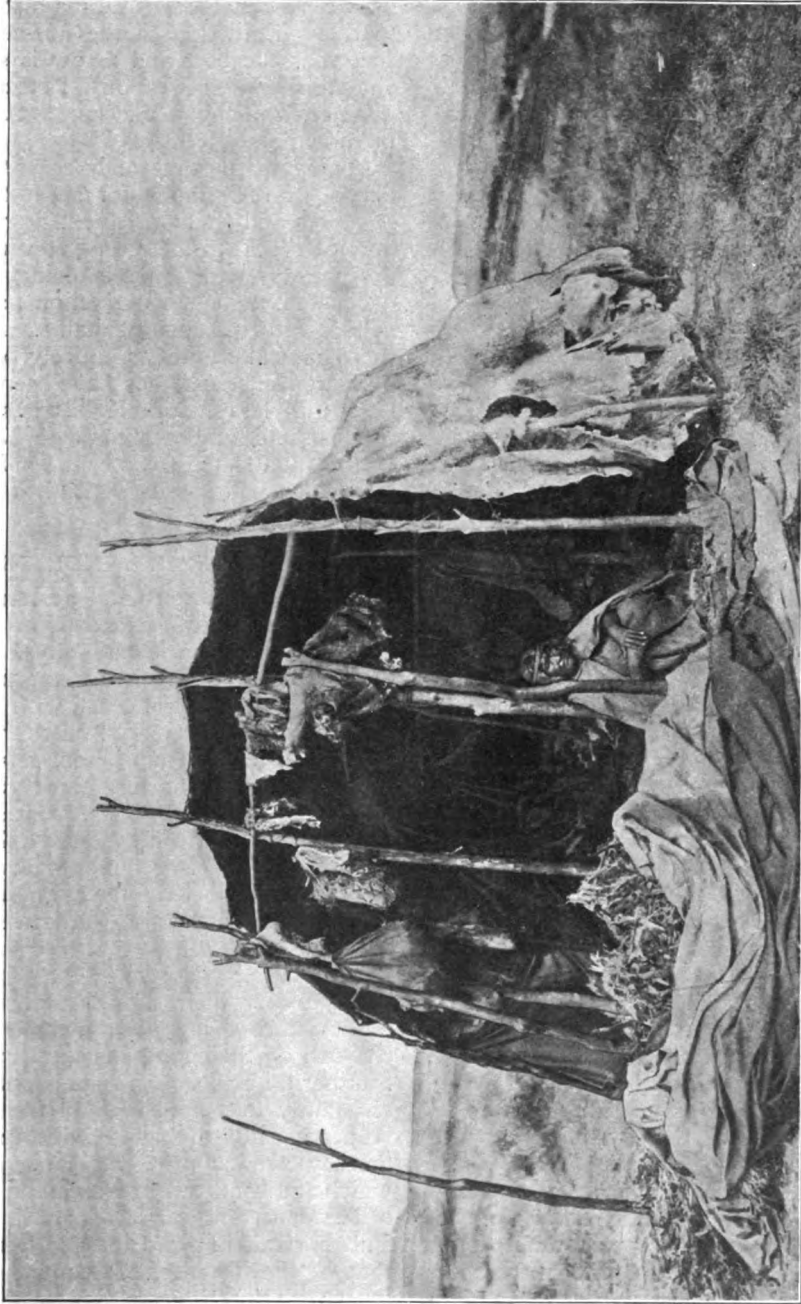
Tehuelches. Upon examination of many of the more perfect of these earthen vessels, it was found that they were punctured with a series of small holes in the bottom, and that the surface of the interior, over the bottom and a considerable portion of the sides also, was blackened and charred, thus bearing unmistakable evidence of having been subjected to the continued action of fire. It occurred to me that such earthen vessels were used for conveying fire from one encampment to another when on the march. Upon inquiry I was pleased to hear this theory confirmed by an aged Tehuelche woman who remembered distinctly that in her childhood fire was frequently transported with them when on the march.

The Tehuelches find their chief employment in hunting the guanaco and rhea or South American ostrich. The region inhabited by them extends northward from the Strait of Magellan along the western border of that part of the country occupied by the prosperous Patagonian sheep farmers, and which lies adjacent to the Atlantic coast. This sheep-farming district extends westward from the coast for an average distance of about thirty miles. Between this thirty-mile strip and the Andes is the home of the Tehuelche. Of the habitable portions of the earth's surface, it is perhaps the most sparsely settled of all. Notwithstanding its natural resources, over thousands of square miles are entirely uninhabited. For the most part, it is indeed comparatively barren, as in the lava beds of the central interior region, but to the westward over the lower slopes of the Andes and in the valleys entering the mountains, there are exceedingly fertile regions, capable of supporting considerable populations, but at present quite unoccupied by either Indians or Europeans. The writer, together with Mr. O. A. Peterson, spent five months of travel during the summer of 1896-97 in the country lying between the sources of the Santa Cruz and Desire Rivers without encountering either whites or natives.

The Tehuelche is and always has been a plainsman. His methods and the implements employed by him in the chase are designed for a level open country, and are not adapted to rough, mountainous, or wooded districts. Greatly reduced in numbers he finds the area still left to him in his natural habitat more than ample to supply his simple wants and satisfy his inherent, nomadic disposition. Left to himself, his necessities are few and easily supplied, for nature in Patagonia is exceedingly lavish in furnishing those animals that provide him with every domestic necessity. Give to the Tehuelche his horse, dogs, and bolas, and destroy all other animal life indigenous to the region save only the guanaco, and he would continue to exist, experiencing little inconvenience.

The guanaco is to his existence the one important and indispensable animal. From its flesh he derives his chief and for long periods only sustenance, while from its skin his industrious wife constructs the family toldo and makes with admirable skill and patience their ample clothing and bedding, fitting and sewing the parts with the nicety and proficiency of a skilled seamstress. A wooden or bone awl used as a delicate punch is her needle, and the sinew taken from the loin of the same animal her thread. From this same beast he likewise obtains the sinew for the light but exceedingly strong thongs of his bolas.

But the guanacos are in no danger of extinction. They roam in thousands over the Patagonian plains. So abundant are they that in travelling across the country it is scarcely possible to pass out of sight of them. Contrary to the general rule with undomesticated animals, the guanacos inhabiting settled regions are far less timid than those of unsettled districts. In that region along the coast occupied by the sheep farmers, they exist in great numbers, are exceedingly tame, and are a source of considerable annoyance to the herdsmen, who nevertheless suffer them to go unmolested.



Tehuelche Tent.

Beyond the settlements the guanacos are more difficult of approach, and in the Cordillera they are exceedingly wary, as is also the rhea or so-called ostrich. This is the more striking and difficult of explanation since the deer in the same mountainous region seem absolutely fearless and prompted by curiosity rather than fear when approached. On several occasions, when in need of meat while traveling through the Southern Andes, we located a band of deer and walked directly up to within twenty or thirty feet of them before shooting. Neither the report of the rifle nor the death-struggles of their companion aroused in them any apparent feeling of uneasiness. The surviving members of the band stood about at a distance of only a few feet, taking notes as it were, while we were engaged in skinning and dressing the carcass of their fallen comrade, often approaching so near that we would be compelled to suspend operations and urge the spectators to remove to a more respectful distance.

THE ONAS OF THE FUEGIAN PLAINS.

Closely resembling the Tehuelches and evidently derived from the same original stock, are the Onas, inhabiting the plains and timbered regions of central, northern, and eastern Tierra del Fuego. Like the Tehuelches they are of splendid physique and live entirely by the chase. They are essentially a plains people and only occasionally frequent the coast. Their island having been separated from the mainland for a remote period of time, they have been practically cut off from all communication with their relatives on the northern shores of the eastern stretches of the Strait, and have thus developed a language quite distinct from that of the Tehuelches, while many of their customs and arts differ materially from those of the latter. Not being a maritime people, they have been unable to import the horse from the mainland, so that the Onas of today are in much the same condition as

were the Tehuelches of the mainland prior to the introduction of the horse. With the Onas the bow and arrow is still the one indispensable weapon for offence and defence, while bolas and horses are quite unknown among them.

Owing to the extremely advantageous nature of their lands for sheep-farming purposes and the consequent aggressiveness of the Fuegian sheep-grower of the present day, the tribe is being rapidly decimated, and their extinction in the no distant future seems inevitable. Already their natural habitat is entirely occupied by Europeans, and they have been driven back into less favorable districts where food is scarce and obtained with difficulty. Naturally a state of constant warfare exists which will inevitably lead to the extermination of the Onas.

THE CHANNEL INDIANS.

Between the eastern and western coasts of Patagonia and Tierra del Fuego there are extreme climatic and physiographic differences. The treeless, semi-arid, and level plains of the east coast, with but few indentations, are replaced on the west by an intricate series of islands, peninsulas, capes, and promontories, separated by a labyrinth of inlets, bays, sounds, and channels, surrounded by one of the most picturesque and rugged mountain systems to be seen anywhere on the earth's surface. These mountains serve as a barrier to the southwesterly winds that prevail here, and effectually deprive them, during the passage over their summits, of most of the moisture with which they have become charged on their long journey across the Southern Pacific. Thus precipitation is constantly taking place, and the surface is perpetually drenched with moisture, thereby producing a vegetable growth, which at low altitudes, even in the latitude of the south and west coasts of Tierra del Fuego, rivals in profusion and luxuriance that of the Tropics. It contrasts strikingly with the eastern plains and river valleys, which are destitute of trees or forests



A Tehuelche Brave—Twenty-five Years of Age.

and where the annual precipitation is just sufficient to support a few species of short but succulent grasses, with occasional clumps of low, scrubby, and usually thorny bushes, characteristic features of semi-arid regions.

The natives of the Pacific coast differ from those of the Atlantic quite as much as do the climate, vegetation, and physiographic features. The natives of the west coast, while belonging to at least two distinct tribes, may be very appropriately denominated, collectively, as Channel Indians. All their activities cluster about the coast. They live on and about the shores of the inland waters of the Fuegian Archipelago and the west coast of Patagonia, never venturing inland for more than a few miles. They are essentially a maritime people, deriving their chief and almost only sustenance from the sea. They are small in stature and inferior in physique to the Tehuelches and Onas of the Patagonian and Fuegian plains, and their origin has undoubtedly been quite distinct from that of the latter tribes.

For houses they usually erect exceedingly primitive structures formed of interwoven or piled-up branches of trees, which would seem, even to most semi-civilized peoples, quite inefficient protection from the storms that almost constantly prevail here. They find their chief occupation in collecting shell-fish, in fishing, and in hunting the fur-seal and sea-otters. From the skins they make their scanty clothing, while the flesh and blubber serve them as additional food.

The chief food of the Channel Indians is the shell-fish that live in great abundance in the waters of this coast. When the supply of shell-fish of any particular cove which may have been selected as a camping-place by a party of these Indians becomes reduced, they place their few domestic necessities in their canoes and proceed by water to a new encampment where food is abundant. In this manner they move about from place to place in

order to procure sufficient food. They eat their food either raw or slightly roasted on fires that are kept constantly burning on a few sods placed in the bottoms of their canoes. They are not entirely carnivorous, frequently varying their diet by the addition of a few species of edible fungi that grow on the beech-trees of the adjacent forests.

Their canoes are fashioned of large slabs of bark supported by numerous ribs of wood and sewed together with thin strips of whalebone. Sometimes they use, instead of bark, thin slabs of wood hewn out with great patience. One or two instances of true dugouts have been reported among the Yahgans inhabiting the eastern portion of the south coast of Tierra del Fuego and the islands about Cape Horn. Their harpoons and spears are almost always of bone.

The Channel Indians are of two distinct tribes, differing in language, though for the most part quite similar in their mode of life and in the arts employed by them in the gaining of a livelihood. The more numerous and more warlike and powerful of these tribes are known as the Alaculoffs. They occupy all the west coast of the mainland together with the adjacent islands, the western stretches of the Strait of Magellan, southern and western Tierra del Fuego as far east as Beagle Channel, and the islands lying to the southwest. The remaining south coast of Tierra del Fuego and the adjoining islands as far south as Cape Horn are the home of the Yahgans, formerly the most powerful of all the Indian tribes of this region, but now nearly exterminated by the combined attacks of the Onas and Alaculoffs, aided by diseases, chiefly pulmonary, introduced among them through the mistaken kindnesses of over-zealous missionaries, themselves exceedingly deficient in the first principles of hygiene.

The Yahgans are doubtless only a remnant of a once powerful people that inhabited the region now occupied by the Alaculoffs. They have been crowded into



Tehuelche 'Squaw.

narrower and narrower limits until finally reduced to their present territory. That they have long dwelt in their present habitat is evidenced by the numerous shell-heaps that have been accumulated about the more favorable camping places along the bays and inlets of this coast.

These shell-heaps or kitchen-middens have been observed attaining to a height of twelve or fifteen feet and to more than one hundred feet in length. The time consumed in the accumulation of such quantities of shells indicates for them a considerable antiquity.

LOCATION OF THE BOUNDARY BETWEEN NICARAGUA AND COSTA RICA

BY ARTHUR P. DAVIS, CHIEF HYDROGRAPHER, ISTHMIAN CANAL COMMISSION

THE promise which the construction of a water-way gives of increased development and commercial importance to the Central American republics, has been a source of considerable jealousy between Nicaragua and Costa Rica, and until recently there was continual dispute over the boundary line between these republics, each being anxious to preserve and increase its territorial interests in proximity to the proposed canal route. Both states had been wrought up by years of fruitless negotiations to a state of readiness for war in defence of what they considered their rights. In fact, war had actually been declared by Nicaragua on November 25, 1857, when, through the mediation of the Republic of Salvador, a final effort to avert it was made. Another convention was held and a definite treaty was concluded between the two republics in April, 1858, Article 2 of which runs as follows:

"The dividing line of the two republics, starting from the northern sea, shall commence from the extremity of Castilla Point, at the mouth of the Rio San Juan of Nicaragua, and shall continue its course along the right margin of said river to a point 3 English miles distant from the

Castillo Viejo, measured from the exterior fortifications of said castle to the point indicated. From there a curve will start, the centre of which shall be said works, and shall preserve a distance of 3 English miles from it throughout its development, terminating at a point which shall be 2 miles distant from the bank of the river, upstream from the castle. From there the line shall continue in the direction of the Sapoa River, which empties into Lake Nicaragua, following a course almost 2 miles distant from the right margin of the Rio San Juan, with its circumvolutions, to its origin at the lake, and of the right margin of the lake itself to the said Sapoa River, where this line, parallel to said margins, will terminate. From the point of intersection with the Sapoa River, which, from what has been said, should be 2 miles distant from the lake, a right astronomical line shall be drawn to the central point of Salinas Bay, in the southern sea, where the demarcation of the territory of the two republics shall terminate."

This boundary was for many years unsurveyed, and after the treaty of 1858 a change occurred in the regimen of the San Juan, by which the main portion of its waters, instead of flowing to the sea

at San Juan del Norte, as formerly, followed another course to the ocean, known as the Colorado River, while the lower San Juan, which was formerly the main stream, became a subordinate distributary. This led to a new dispute, Nicaragua claiming that the main stream, or Colorado River, was the true boundary, and calling in question in general the validity of the provisions of the treaty of 1858. This dispute was submitted to the arbitration of President Cleveland, who made an award on March 22, 1888, declaring the treaty to be valid, and the old or San Juan River to be the line. This decision was accepted by both republics, and at their request an umpire was appointed by President Cleveland to decide doubtful points during the survey of the boundary line. General E. P. Alexander, of North Carolina, was appointed to fill this position, and the boundary line has recently been surveyed.

During the progress of this survey several interesting points of difference arose between the representatives of Nicaragua and Costa Rica, which were decided by the arbitrator to the satisfaction of both parties. The first point, and a very important one, related to the point of beginning, called in the treaty "Punta de Castilla." The lower San Juan, after separating from the Colorado, flows toward Greytown for a considerable distance and then sends a small distributary to the ocean called the Tauro. The main river reaches the Caribbean near Greytown, through two mouths with an insular delta between them.

Nicaragua claimed that the mouth of the Tauro should be considered as the mouth of the San Juan, and that the point of beginning was at the right bank of the mouth of this distributary, but there seems to have been little basis for this claim.

Costa Rica claimed as the starting point the western extremity of the deltaic island, the base of this claim being that this was the right bank of the mouth of the

main San Juan and that it had been called Punta de Castilla by three authorities cited, one of them being a prominent Nicaraguan politician, Mr. J. A. Gamez.

The arbitrator pointed out, however, that a large array of authority, including nearly all public maps, called this Punta Arenas, and that if such an important concession had been made by Nicaragua the representatives of Costa Rica would certainly have insisted upon mentioning the name "Punta Arenas" in the treaty, and similarly, if the Tauro had been intended, the representative of Nicaragua would certainly have insisted upon the insertion of that name; but neither of these names occur in the treaty. The point which was the extremity of the headland of Punta de Castilla in 1858 has now long been swept over by the Caribbean Sea, and so many changes have occurred in the shore outline that it is not now possible to locate the exact spot. The arbitrator therefore decided that "under these circumstances it best fulfils the demands of the treaty and of President Cleveland's award to adopt what is properly the Headland of to-day; or the northwestern extremity of what seems to be the solid land on the east side of Harbour Head Lagoon; and the initial line of the boundary to run as follows, to-wit:

"Its direction shall be due northeast and southwest, across the bank of sand, from the Caribbean Sea into the waters of Harbour Head Lagoon.

"It shall pass, at its nearest point, three hundred (300) feet on the northwest side from the small hut now standing in that vicinity.

"On reaching the waters of Harbour Head Lagoon the Boundary Line shall turn to the left, or south-eastward, and shall follow the water's edge around the Harbour, until it reaches the river proper by the first channel met.

"Up this channel, and up the river proper, the line shall continue to ascend as directed in the Treaty."

The next point of difference was that

with regard to the edge of the river, Nicaragua claiming that it should be the edge at high water and Costa Rica claiming the edge at low water. Both claims were overruled, that of Nicaragua including as a portion of the river large areas of land covered with vegetation submerged at extreme high water, and Costa Rica's including within her territory numerous islands which were connected to the land by sand-bars, exposed at extreme low water. As the river was referred to in the treaty always as a navigable stream, General Alexander decided the line to be that indicated by the surface of the water at the lowest navigable stage of the river, which is rather above the average height, the lower river being scarcely navigable at mean stages.

The survey followed this line on the right bank of the river to a point three English miles below the Castillo Viejo. Here the line left the river, the point being marked by a large concrete monument. From here, owing to the dense tropical jungle, the line was not actually run, but points upon the line were located on streams, and at other places which were accessible either by boat or by land, and every foot of the line from Castillo to the Pacific is located by a compromise of the engineers.

Another important point of difference was with regard to the definition of the expression "the right margin of Lake Nicaragua." The argument and award of General Alexander are as follows:

"Under the influence of rainy seasons of about seven months, and dry seasons of about five, the level of Lake Nicaragua is in constant fluctuation. We shall have to discuss five different stages.

"1st. Extreme high water; the level reached only in years of maximum rainfall, or some extraordinary conditions.

"2nd. Mean high water; the average high level of average years.

"3rd. Mean low water; the average low level of average years.

"4th. Extreme low water; the lowest

level reached in years of minimum rainfall, or other extraordinary conditions.

"5th. Mean water; the average between mean high water and mean low water.

"The argument presented to me in behalf of Nicaragua claims that the level to be adopted in this case should be the first level named, to-wit: extreme high water. It argues that this line and this line alone is the true limit of what the argument calls the 'bed of the lake.' Costa Rica claims the adoption of the third level, to-wit: mean low water. This is argued principally upon two grounds: First, it is shown by a great number of legal decisions that, in most states, all water boundaries are invariably held to run at either extreme or mean low water. Second, it is claimed that, in case of any doubt, Costa Rica is entitled to its benefits, as she is conceding territory geographically hers.

"I will begin with Costa Rica's first argument. The equity of adopting a low water line in the case of all water boundaries is readily admitted, even though instances of contrary practice exist.

"Between all permanent lands and permanent waters usually runs a strip of land, sometimes dry and sometimes submerged. We may call it, for short, semi-submerged. Its value for ordinary purposes is much diminished by its liability to overflow, but, as an adjunct to the permanent land, it possesses, often, very great value. If the owner of the permanent land can fence across the semi-submerged he may save fencing his entire water front. He also can utilize whatever agricultural value may be in the semi-submerged land in dry seasons. Both of these values would be destroyed and wasted if the ownerships were conferred upon the owner of the water. Therefore equity always, and law generally, confers it upon the owner of the permanent land.

"I recognized and followed this principle in my award, No. 3, where I held that the boundary line following the right

bank of the San Juan River, below Castillo, follows the lowest water mark of a navigable stage of river. And, if now the lake shore were itself to be the boundary of Costa Rica, I would not hesitate to declare that the semi-submerged land went with the permanent land and carried her limits at least to the mean low-water line.

"But this case is not one of a water boundary; nor is it at all similar, or 'on all fours' with one, for none of the equities above set forth have any application. It is a case of rare and singular occurrence and without precedent, within my knowledge. A water line is in question, but not as a boundary. It is only to furnish starting points whence to measure off a certain strip of territory. Clearly the case stands alone, and must be governed strictly by the instrument under which it has arisen. That is the treaty of 1858; and its language is as follows:

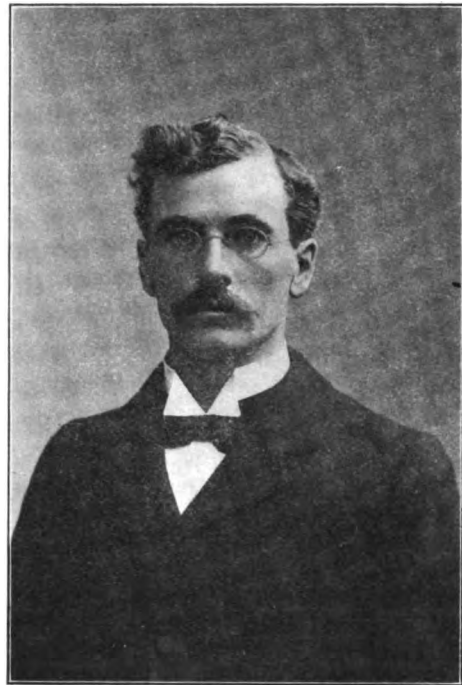
"Thence the line shall continue towards the river Sapoa, which discharges into the Lake of Nicaragua, following a course which is distant always two miles from the right bank of the river San Juan, with its sinuosities, up to its origin at the lake, and from the right bank of the lake itself, up to the said river Sapoa, where this line parallel to the said banks will terminate."

"The principles upon which the language and intent of treaties are to be interpreted are well set forth in the Costa Rica argument by many quotations from eminent authors. All concur that words are to be taken as far as possible in their first and simplest meanings—in their natural and obvious sense, according to the general use of the same words—in the natural and reasonable sense of the terms—in the usual sense, and, not in any extraordinary or unused occupation."

"We must suppose that the language of the treaty above quoted suggested to its framers some very definite picture of the lake with its banks, and of the two-mile strip of territory. It, evidently, seemed to them all so simple and obvious

that no further words were necessary. Let us first call up pictures of the lake, at different levels, and see which seems the most natural, obvious and reasonable.

"The very effort to call up a picture of the lake, at either extreme high water or extreme low water, seems to me immediately to rule both of these levels out of



A. P. Davis, Chief Hydrographer, Isthmian Canal Commission.

further consideration. Both seem unnatural conditions, and I must believe that, had either been intended, additional details would have been given.

"Next; is the mean low water mark the first, most obvious and natural picture called up by the expression, 'the bank of the lake?' It seems to me decidedly not. During about eleven months of the year this line is submerged, invisible and inaccessible. It seems rather a technical

line than a natural one. The idea of a bank is of water limited by dry land with some elements of permanency about it. Even during the brief period when the line is uncovered, the idea of it is suggestive far more of mud and aquatic growths than of dry land and forest growths.

"To my mind, the natural, simple and obvious idea of the bank of a lake, in this climate, is presented only by the line of mean high water. Here we would first find permanent dry ground every day of an average year. Here an observer, during every annual round of ordinary seasons, would see the water advance to his very feet and then recede, as if some power had drawn the line and said to the waters, 'hitherto shalt thou come but no further.' Here the struggle between forest growths and aquatic vegetation begins to change the landscape. Here lines of drift, the flotsam and jetsam of the waves naturally suggest the limits of the 'bed of the lake.'

"Without doubt, then, I conclude that mean-high-water mark determines the shore of the lake; and it now remains to designate that level, and how it shall be found.

"Several surveys of the proposed Nicaraguan Canal route, beside that of Commander Lull above quoted, have been made within the last fifty years. Each found a certain mean high level of the lake, and it might seem a simple solution to take an average of them all. But, as each adopted its own bench-mark on the ocean, and ran its own line of levels to the lake, I have no means of bringing their figures to a common standard. It seems best, therefore, to adopt the figures of that one which is at once the latest and most thorough, which has enjoyed the benefit of all of the investigations of all of its predecessors, and whose bench-marks on the lake are known and can be referred to. That is the survey, still in progress, under the direction of the United States Canal Commission. Its results have not yet been made public, but, by the courtesy of

Rear-Admiral J. G. Walker, President of the Commission, I am informed of them in a letter dated July 10, 1899, from which I quote:

"In reply I am cabling you to-day, as follows: 'Alexander, Greytown, Six;' the six meaning, as per your letter, 106.0 as mean high level of lake. This elevation of 106.0 is, to the best of our knowledge (Mr. Davis, our hydrographer), the mean high water for a number of years.

"The highest level of the lake in 1898 was 106.7, last of November. The elevation of our bench mark on inshore end of boiler at San Carlos is 109.37.

"A complete copy of this letter will be handed you, and also blue-prints of the maps made by the Commission of the lower end of the lake, which may facilitate your work.'

"As this Commission is the highest existing authority, I adopt its finding, and announce my award as follows:

"The shore line of Lake Nicaragua, at the level of 106.0 feet, by the bench marks of the United States Nicaragua Canal Commission, shall be taken as the bank of said lake referred to in the treaty of 1858."

The location of the line around the southern margin of the lake was the most difficult part of the whole survey. The country here is a vast morass, densely covered with tropical vegetation, even the sluggish streams being mostly choked with aquatic plants. The high water line was defined as 106 feet, while the level of the lake at the time of the survey was about 102. It became necessary, therefore, to determine an elevation four feet higher, which was usually several miles from the water's edge.

By means of levelling, it was ascertained that the swamps had a mean slope toward the lakes of about one foot per mile, and this was made the basis of most of the agreements. A few points on streams were located, the area of Nicaragua's two-mile zone was calculated, and

the boundary was defined by long tangents, including the proper area.

On reaching the Sapoa River a monument was erected, and a broken line to Salinas Bay was run, the boundary of the bay itself was surveyed, and the island was located.

The last important point decided by General Alexander was perhaps the knottiest of all. It was the definition of the centre of Salinas Bay, and the decision was both just and ingenious. The remarks of the Arbitrator are as follows:

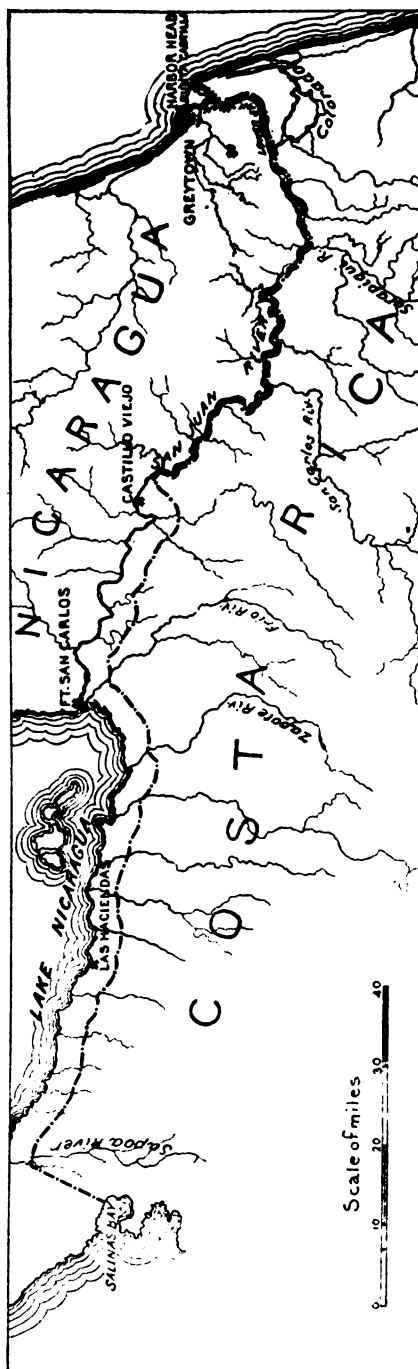
"The Bay of Salinas was carefully surveyed and mapped by officers of the United States Navy in 1885, and a map of the same is published in the United States Naval Hydrographic office, No. 1025. I have adopted this map, with the consent of both commissions, as correctly representing the outline of the Bay. In shape it is a curved pocket, starting east and bending southward, about five miles long, and about one-half of that in average width. Its outline a little resembles the rounded handle or butt of a pistol, with some irregular projections and indentations.

"It is desired to find the mathematical centre of this figure, closed by the straight line joining the headlands of the Bay.

"The mathematical centre of an irregular figure is the mid-position of its area. All mechanical centres, such as the centre of gravity or of equilibrium, etc., in which the action of any force is concerned, must be excluded from consideration.

"This will readily appear if we consider for a moment the case of a bay in the shape of a crescent. The centre of gravity of its figure would not fall upon the water of the bay at all, but upon the promontory of land embraced by the water. This, of course, could not be considered as the centre of the bay.

"Neither is any general mathematical process applicable, such as that of the method of Least Squares. This method will find the centres of any group of random spots, but were they disposed in cres-



Map Showing the Boundary Between Nicaragua and Costa Rica.

cent form, the centre would be, not among them, but within the convex space which they partially surround.

"Other methods must therefore be devised for finding the mid-position of irregular and restricted areas, and many might be suggested, more or less applicable to different figures. But it will be sufficient here to indicate only the method which I have adopted as best suited to the figure in hand, possessing, as this does, something of a curved or crescent shape.

"I have supposed a vessel to enter the Bay from the ocean, at a point midway between its headlands, and to sail a course as nearly as possible equidistant between the opposite shores, on the right and left, until it has penetrated to the remotest point of the Bay.

"This course, being carefully plotted upon the map, although curved, may be taken as the long axis of the Bay.

"At right angles to it, at different points, I have drawn straight lines reaching across the Bay from shore to shore, and, by use of a planimeter, I have determined the position of such a line which will exactly divide the whole area of the Bay into equal parts. This line may be taken as the corresponding short axis of the Bay, and its intersection with the long axis will be the centre of the Bay.

"When at that point, a line drawn across the bow of the supposed vessel, perpendicular to her course, would have one-half of the waters of the Bay in front of it and one-half behind it.

"Having carefully located the point in this manner, I have determined from the scale of the map, its distance from the summit point of the small island in the Bay, whose latitude and longitude are given upon the map as follows:

Latitude, $11^{\circ} 03' 10''$
Longitude, $85^{\circ} 43' 38''$

"It proves to be 37 seconds to the northward and 14 seconds to the eastward of this point.

"I therefore fix the position of the centre of Salinas Bay to be:

Latitude, $11^{\circ} 03' 47''$ North.
Longitude, $85^{\circ} 43' 24''$ West.

"Toward this point the boundary line must run, from its meeting with the Sapoa River, unless the two Commissions can agree upon a line with natural landmarks."

All the Arbiter's decisions were amicably received by both Republics, the questions in dispute are settled, and the boundary marked with sufficient accuracy for many years to come.

THE NICARAGUA CANAL

THE route for the Nicaragua Canal as projected by the present Isthmian Canal Commission is shown on the accompanying map. It generally follows the course of the San Juan River for one hundred miles from the Caribbean Sea to Lake Nicaragua about one hundred and five feet above it, then it traverses the lake for a distance of seventy miles to the mouth of the Rio Las Lajas, and after following the valley of that stream for a short distance, crosses

the continental divide, forty-four feet above the lake, and descends the valley of the Rio Grande to Brito, seventeen miles from Lake Nicaragua.

The canal as proposed will have a mean depth at low water of thirty-five feet and a bottom width of one hundred and fifty feet. This width is for the straight sections; on curves with a radius of less than 12,000 feet the width is increased at the rate of one foot for each two hundred feet; thus a curve with a radius of 6,000 feet

will have a width of one hundred and eighty feet.

Starting from the Atlantic terminus the canal may be described as consisting of three stages: first, a period of ascent for a distance of fifty miles from Greytown till it enters the San Juan at a point about two miles above the mouth of the San Carlos River. This stage must be excavated. Second, a period of one hundred and twenty miles of high level, the level

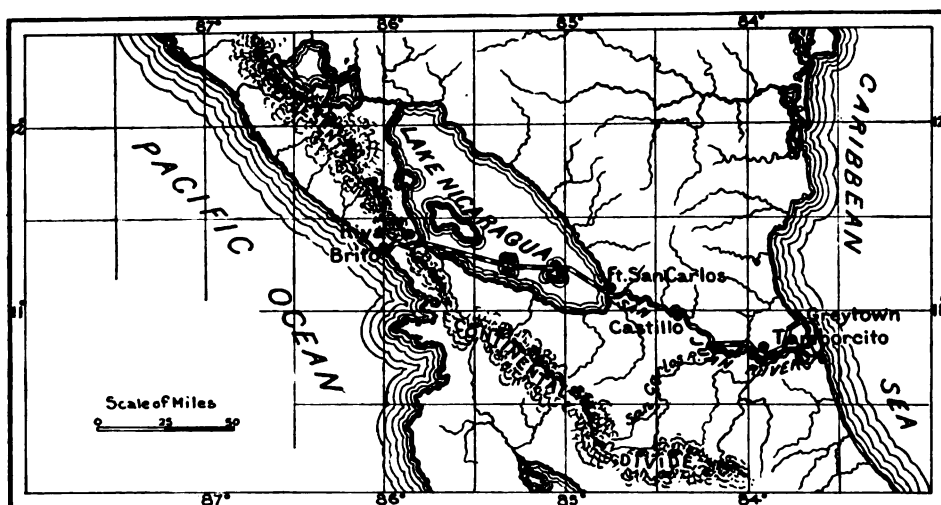
Second. The excavation of the canal prism in the swamp sections between Greytown and the Florida Lagoon.

Third. The heavy cutting near Boca San Carlos and at Tamborcito.

Fourth. The construction of the large dam at or near Boca San Carlos in connection with the regulation of the summit level.

Fifth. The Locks.

Some fifty years ago there was a



Map Showing Route of Nicaragua Canal as Proposed by Isthmian Canal Commission.

of Lake Nicaragua, secured by means of an immense masonry dam which will extend the level of the lake fifty miles down the San Juan. This stage consists of improved river and lake channels. Third, a period of descent from the lake level to the Pacific through the continental divide. This stage, seventeen miles, must also be excavated.

The salient engineering problems connected with the Nicaragua Canal project as outlined by the Commission are as follows:

First. The construction of harbors at the termini of the canal.

good harbor at Greytown, the eastern terminus of the canal, with thirty feet of water at the anchorage and about the same depth in the entrance. The entrance to this harbor where it then existed, has been obliterated and the harbor itself is now a lagoon almost entirely enclosed, of restricted area, with only about half the depth of water in it that formerly existed. Vessels for Greytown are now compelled to anchor in the offing and discharge their cargoes on lighters which are taken into the lagoon across a bar having a depth of less than six feet of water. As the prevailing trade winds are



Travelling in Nicaragua.

strong and blow almost directly on this part of the canal, the construction of a harbor at this terminus becomes necessary in the early stages of the work as well as for use after the canal is completed.

It is proposed to construct, by excavation, a harbor of sufficient area to accommodate vessels using the canal. The entrance would have a minimum depth of thirty-five feet and a bottom width of five hundred feet, guarded by two jetties springing from the shore line near Harbour Head. These jetties are to be built of loose stone to a height of six feet above mean high tide, the hearting to be composed of small and the outer portion of large stone, not easily moved by the waves. It is not expected, however, that the construction of the jetties will alone form the entrance. Dredging will also be necessary and its maintenance may require an extension of the jetties or dredging or both.

The western terminus of the canal will be near Brito. Here, as at Greytown, there is no harbor, and an artificial one must be constructed. The same general engineering principles will guide in its construction. The width and depth of the

entrance will be the same. The sand movement on the western coast, however, is slight as compared with that in the vicinity of Greytown. The prevailing winds on this side are off-shore, and destructive storms seldom visit this part of the coast. The cost of maintenance of the harbor on the west side will therefore be less than that of the one on the east side at Greytown.

For a part of the distance between Greytown and the Florida Lagoon the canal line passes over swampy sections, where the material is too soft to support the embankments necessary to keep out the floods of the San Juan, and to maintain the canal level itself. Protecting embankments are therefore to be constructed over these sections. These embankments are to be located as far as practicable on the firm land composing the neighboring hills. In places, however, they cross ground which is soft to a considerable depth. Waterways are provided on the embankment lines to dispose of flood water in the protected areas.

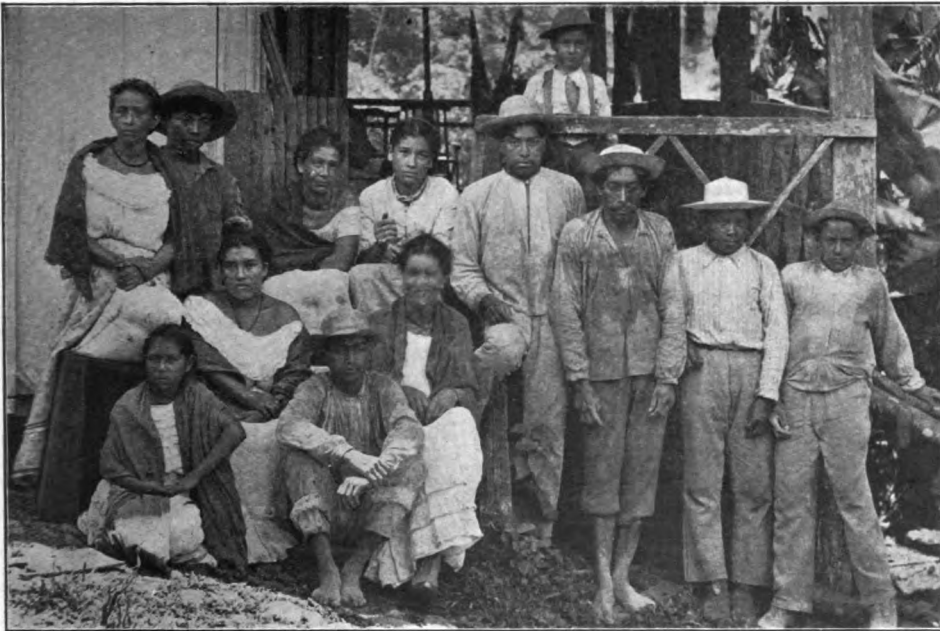
At two places near the Boca San Carlos dam site heavy cutting is encountered, the maximum depth for short distances being

two hundred and eighteen and one hundred and seventy feet respectively; but the deepest cut of all is at Tamborcito, about twenty-six miles from Greytown. Here the high ground north of the canal approaches so close to the river that a cut through it becomes imperative. The ridge is narrow, however, the width at the top being only a few feet and at the level of the water in the canal less than three thousand feet, but the extreme depth of the cut is two hundred and nineteen feet. The borings show that it is nearly all hard rock. The less heavy cuts will also be in firm ground, but the exact character of the material cannot be stated until the borings now in progress have been completed.

The most difficult engineering work in connection with the Nicaragua Canal project is the construction of a dam across the San Juan River to hold back the waters of the lake and enable its level to be regulated. It is of great importance

that this dam should be located above the mouth of the San Carlos River, as the latter discharges at times as much as 100,000 cubic feet of water per second, carrying with it great quantities of sand.

Lake Nicaragua, which forms a part of the summit level, is about one hundred miles long and forty-five miles wide, and is distant only about twelve to thirty miles from the Pacific. Originally it was an arm of the Pacific Ocean, but the shifting of the continental divide cut it off from the sea. The lake discharges through the San Juan River into the Caribbean Sea near Greytown. For the upper half of its course the San Juan winds through hilly country. Neither it nor any of its tributaries in this section carries much sediment, and a slack water navigation by means of locks and dams is practicable. But half way down its course the San Juan River receives the waters of the San Carlos which carry great quantities of



Natives of Nicaragua.

sand and thus render the San Juan useless for the purposes of a canal beyond their junction. The canal route, therefore, is compelled here to leave the San Juan, which can no longer be of service, and find to the sea an independent way.

Lake Nicaragua can furnish an unlimited supply of water to the canal. It is believed that it varies in its level as much as thirteen feet. Such an extreme fluctuation occurs, however, only at relatively remote intervals. This fluctuation will be reduced by the construction of the dam in the San Juan River just above the San Carlos, whose waters cannot be used because of the load of sediment they carry.

To reach the summit level from the Atlantic side five locks will be constructed, the first having a lift of thirty-six and one-half feet and the other four a uniform lift of eighteen and one-half feet, except the lock at the summit, the lift of which will vary with the level of the lake. The locks will be seven hundred and forty feet long by eighty feet wide in the clear, with a depth of thirty-five feet over the miter-sill.

From the Pacific side the summit will be reached by four locks of uniform lift of twenty-eight and one-half feet. It is assumed that the mean level of the two oceans is about the same. The mean range of tides on the east is about one foot and that on the west side about eight feet.

The following table gives the distances on the Nicaragua route:

Number of miles of canal proper.....	67.33
Number of miles of river improved...	27.96
Number of miles not requiring improvement	17.26
Number of miles of lake channel 300 feet wide	22.19
Number of miles of lake not requiring improvement	48.74
Number of miles of harbors and entrances to same	3.05

Total number of miles from ocean to ocean, measured from the 6-fathom curves 186.53
Time necessary to pass through the canal, 33 hours.

The Isthmian Commission believe that it would take ten years to construct the canal, and that the cost would be at least \$200,000,000.

THE TSANGPO

By JAMES MASCARENE HUBBARD

THE Tsangpo is in several respects the most remarkable river in the world. It is the highest of all navigable streams, flowing for nearly a thousand miles at an elevation of from 11,000 feet to 14,000 feet. During the greater part of its course its current is sluggish, but for a hundred miles or more the mighty river, in its descent to the coast plain, runs with the speed of a mountain-torrent. Though one of the largest of Central Asian streams, it has never been followed from its source to its mouth, and until recently it was doubtful of which of two well-known rivers it was the head-waters.

The attempts to solve its mysteries have been attended with an almost unparalleled heroism, endurance, steadfastness, and self-sacrifice. For the principal explorers of the Tsangpo have been animated, not as those who sought the fountain-springs of the Nile, by the hope of the world's applause at their success—that was denied them—but for a simple daily wage and the consciousness of loyalty to duty.

The physical history of the Tsangpo is briefly this: It rises in the extreme southwestern corner of Tibet, close to the sources of the Ganges, the Indus, and its great affluent, the Sutlej, at a

height of nearly 15,000 feet. Receiving the drainage of the slopes of the Himalayas and of a little-known Tibetan range running parallel with these mountains, it soon becomes a stream wide and deep enough to be navigable. There is a considerable boat traffic upon it, at an elevation but little below the summit of Mt. Blanc. It flows due east for some eight hundred miles, receiving numerous large tributaries from both south and north, and when near Lhasa it is, at low water, nearly a third of a mile wide and twenty feet deep; in flood, two miles wide and of unknown depth. In longitude 94° E. it makes a sharp bend to the south, and passes through the Himalayas in a course known only to the savages who dwell upon its precipitous banks.

When last seen by an explorer it is at a height of from eight to eleven thousand feet, but when it emerges in Assam it is only four hundred feet above sea-level. From this point it pursues its sluggish way for another eight hundred miles as the Brahmaputra to the Ganges and the Bay of Bengal. There has been a long controversy, into the details of which it is not necessary to enter, as to whether the Irawadi or the Brahmaputra is the continuation of the Tsangpo. Though there has been as yet no direct evidence—the last expedient of throwing in marked logs in Tibet having failed—the general consensus of scientific opinion is in favor of the Brahmaputra, and the latest English gazetteer describes it under this name.

It is hardly to be expected that pure science will be much benefited by the lifting of the veil which hangs over this part of the river's course. But there can be little doubt that it hides scenes of magnificent beauty and grandeur which will thrill the expectant world, and give it new and nobler conceptions of the sublimity of nature.

The imagination fails to grasp the reality, as there is no other instance on earth of a large river dropping eight

thousand feet in one hundred and fifty miles, plunging with the mad rush of a mountain-brook hemmed in by ranges whose peaks are from thirteen to twenty-two thousand feet in height. The native testimony is conclusive as to the existence of at least one awe-inspiring fall before Tibetan territory is left. A scientific journal* published, a few years ago, a copy of a picture of them by a native Tibetan artist who lived in their vicinity. It shows them enveloped in clouds of mist and spray, and the cliffs are covered by sub-tropical vegetation. The local lamas relate to the awe-struck pilgrim that amid the thundering water stands a king-devil, placed there under a spell by the lamas, and, when the river is low, the faithful can see his figure looming dimly through the falling waters.

It has not been from the lack of the spirit of adventure, or because of the natural difficulties presented by the region—great though they doubtless are—that no white man has solved the mystery of this part of the river's course. Its attempted ascent from the plains of Assam has been absolutely prohibited hitherto by the Indian Government on the entirely reasonable ground that there is almost a certainty that the explorer would be killed by the savage Mishmis, who are intolerably jealous of the presence of a stranger in their country. This would necessitate a punitive expedition costly in treasure and in life—an evil by no means commensurate with the gain of having satisfied what is, after all, pure curiosity. The Tibetan officials also, while preventing so far as they are able any white men from entering Tibet, for some unknown reason forbid Tibetans even to attempt to descend the river beyond their own frontier.

The Tsangpo has been explored, however, with the exception of this one hundred and fifty miles, notwithstanding

* Geographical Journal, vol. 5, p. 258.

ing the opposition of the Tibetans and the difficulties presented by the highest mountain region in the world, though not by white men. At any time within the last thirty-five years the trans-Himalayan traveller might have met a caravan of Tibetan and Indian traders with their pack-laden sheep climbing or descending some steep mountain-pass, or crossing the Tsangpo on rafts. Walking humbly with the servants and slaves, for to walk is a mark of servitude with those people, there would be an Indian with tea-bowl and prayer-barrel suspended at his girdle, counting his rosary as he walked, differing in nothing apparently from his companions except in his more intelligent face and the greater interest with which he noted everything about him. But open his prayer-barrel, which he piously twirls when he comes to some particularly dangerous spot, and there will be found in it, instead of the scroll with the Buddhist prayer, "Om mani padmi hom," notes of the journey after the boundary was crossed, observations with sextant and compass, and a simple route-survey showing the length of each day's march, the relative position of the prominent peaks, the course of the streams, and their approximate breadth and depth. Examine closely his rosary, and one would discover to his surprise that, instead of the orthodox one hundred and eight beads, there were only a hundred, and that he dropped one at every hundred steps, which were uniformly two and a half feet long. If he were watched carefully he would be seen to steal from camp at night, when all else were sleeping, if biting wind, freezing cold, and driving snow permit, with his box and tea-bowl. Taking from beneath the false bottom of his box a few instruments, and pouring some quicksilver into his tea-bowl for an artificial horizon, he makes an observation of some star, notes the condition of barometer and thermometer, compares his chronometer with his watch, and then goes back to camp to write up his

journal, and at length to sleep. Years after, the traveller might see this same man at the Great Trigonometrical Survey in Calcutta reading to an English officer his journal, explaining his observations and route-survey, and narrating his adventures—in one instance these included a seven years' slavery in Tibet. He asks who he is, and is amazed to learn that he is only a school-master in a little Himalayan village in the district of Kumaon.

What is his reward for these year-long toils, sufferings, and dangers, this daily risking his life in an attempt to add to the world's knowledge? A little piece of land, possibly a small pension, and, while he is able to serve—oblivion. But soon the scientific journals will be full of accounts of the wonderful journey of the native Indian explorer, the great extent and marvellous accuracy of his survey, his pluck and endurance, his fertility of resource, and, above all, his single-hearted devotion to the cause of science. If his services are publicly recognized by some great Society, with the names of world-renowned explorers, we read merely, "The Pundit employed by Captain T. G. Montgomerie—a gold watch—for his route-survey in Great Tibet." *

It was in 1861 that the successful opposition of the Tibetans to the exploration of the trans-Himalayan region, by Europeans, as well as the fact that Indian traders were permitted to travel freely throughout Tibet, suggested to an officer connected with the Great Trigonometrical Survey of India the expedient of employing native surveyors.

The village school-master, Nain Singh, who had been in the service of the brothers Schlagintweit during their explorations in Kashmir, was the first man to re-

* Royal Geographical Society Year-Book, 1899, p. 208. It should be said, however, that in 1877 the patron's medal was bestowed on the Pundit Nain Singh—then incapacitated for further service. Two others are also mentioned by name in the list of recipients of awards.

ceive the necessary training for the work. At the head-quarters of the Survey he was taught the use of the sextant, compass, etc., to recognize all the larger stars, to walk with paces of uniform length, and to make a simple route-survey. When these things had been sufficiently acquired, he was sent to explore the Tsangpo from its source to India, if possible. It was 1865 before he succeeded in establishing himself in Tibet as a trader desiring to buy horses and at the same time, as a pious Buddhist, to do homage to the Lhasa Lama. His "instrumental equipment consisted of a large sextant, two box sextants, prismatic and pocket compass, thermometers for observing temperature of air and of boiling water, pocket chronometer and common watch, with apparatus, the latter reduced as much as possible." After numerous adventures he finally reached Lhasa, where he had an interview with the Grand Lama, whom he described as a fair and handsome boy of about thirteen years of age, seated on a throne six feet high, attended by two of the highest priests, each holding a bundle of peacock feathers. In this journey he was able to follow the course of the river only to the neighborhood of Lhasa, some six hundred miles. Nor did he succeed in tracing it farther in a second journey made seven years later—a journey memorable, however, from the fact that he

made a route survey of 1,319 miles, 1,200 of which were through country never previously explored, and took four hundred and ninety-seven observations. During all this time he was known to the scientific world only as the "pundit," but the sufferings of this last journey having so affected his health as to compel him to give up his connection with the Survey, his name was disclosed. He has been followed by others, among whom those known as A—k, D—m—g, and K. P. have accomplished the most in trans-Himalayan exploration, all men of like courage, endurance, and animated by a single-minded devotion to their duty. But none have succeeded, as yet, in tracing the Tsangpo's course through the mountains to Assam.

But there are indications of a change of feeling of the rulers of Tibet toward the Indian Government which promises free intercourse between the two countries in the not distant future. As the deadly hostility of the Mishmis to strangers penetrating their mountain fastnesses has been largely due to Tibetan influence, we may look in time to a similar change among them to friendliness. If this should be the case, we trust that the man who lifts the veil which shrouds this wondrous passage of the river through the Himalayas may be one of that noble band, a native Indian surveyor.

RECENT CONTRIBUTIONS TO OUR KNOWLEDGE OF THE EARTH'S SHAPE AND SIZE, BY THE UNITED STATES COAST AND GEODETIC SURVEY.

By C. A. SCHOTT

THE Survey has just published a quarto volume containing an account of the transcontinental triangulations and measurements of an arc of the parallel in latitude 39° . It also has ready for publication the manuscript giving the result of an oblique arc in the eastern part of the United States. Both are contributions of great length and among the first of their kind in America.

At first sight it might appear rather late in the history of the Survey to bring out results of the earth's figure. But it should be remembered that such measures were not the prime object of the Survey in its early stages of activity, but came about in the natural course of continuous development during nearly two-thirds of a century. What was required was to secure a series of geodetic measures consistent within themselves and serving as a bond binding together the separate detail surveys so as to form ultimately a systematic whole. This requirement demanded the establishment of extended primary triangulations not only along our coasts, but also as a connecting link across the country from ocean to ocean, to secure uniformity of results. The growth of these operations depended of course upon the immediate requirements of the Survey for the production of harbor and coast charts and was subject to the means available from year to year.

Thus when I state that the first was made between the years 1844 and 1898, and the second between the years 1833 and 1898, I do not mean that it took fifty-four and sixty-five years respectively to complete the task. Indeed, in either case

there were many years of interruptions. What these long intervals signify and emphasize, is, that the various operations of the Survey were more urgently required in the production of practical results for immediate use and in a great measure as aid to navigation. For the more technical part of the work the available knowledge of the earth's magnitude was sufficient for the early needs. At the same time it was recognized that the measurement of the earth required the same means and methods as that of an extended country, viz., a net-work of primary triangulations and a number of astronomical determinations for latitude, longitude, and azimuth of its points. In time, therefore, sufficient material would accumulate to direct special attention to this, the highest feature of geodesy.

After the triangulations had reached hundreds of miles in extent, and the geographical positions had been determined by their development upon the surface of a spheroid representing the shape and size of the earth, it became a matter of importance to see that the direct astronomical measures for latitude and longitude kept in close accord with the corresponding geodetic measures; thus it came about that in February, 1880, the Survey changed its first reference spheroid, that of Bessel, for a more suitable one, that of Clarke of 1866.

When in 1889 the United States, by resolution of Congress, consented to become a member of the International Geodetic Association for the measurement of the earth, the subject of the measures of

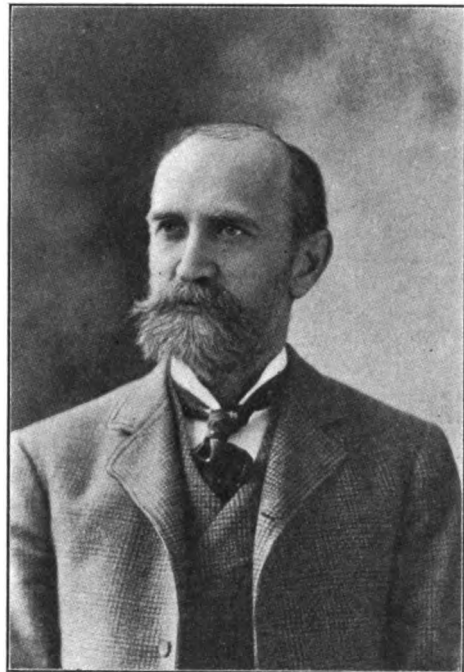
arcs came into greater prominence, and thus the field work of the two arcs, then fairly under way, was accelerated and brought to a close late in the year 1898.

Before entering upon the detail of the two arcs it may not be out of place to state that in order to obtain a measure of the dimensions of the earth, as represented by a spheroid, that is, by a surface generated by the rotation of an ellipse about its minor axis, it is essential that we should be in possession of at least two arcs or of an equivalent thereof. For combinations of two arcs of the meridian, their mean latitudes should differ widely; the same is true for the combination of two arcs of the parallel. We may also obtain an arc of the meridian with one of the parallel, but in every case the measures should be of considerable extent. Arcs of less than 5° (about 556 km., or 345 st. miles) would now be regarded as short ones. It has been stated that one of our arcs is an oblique arc, and as it possesses a great range of latitude and also of longitude and is supplied with a large number of astronomic measures, it is of itself sufficient for the deduction of values for the dimensions of the earth. Furthermore, it may be remarked that for any relatively small part of the earth's surface an osculating spheroid may be determined, as, for instance, was done for our oblique arc. Such a spheroid has the property that its surface is in best accord, as regards curvature, with the actual or physical one, the latter considered as a mathematical surface of equilibrium and generally known as geoid.

The definition of an osculating spheroid thus implies that the sum of the squares of the difference between the various astronomic and geodetic measures be a minimum. The mathematical treatment of the combination of the arc measures differs according to their nature, whether they are extended in a certain direction or whether large areas are covered, but in its generality it is necessarily laborious.

The salient points of the two arcs under

consideration and the results reached may now be briefly stated. First, the arc of the parallel in latitude 39° .* It extends from Cape May, N. J., on the Atlantic coast, to Point Arena, Cal., on the Pacific coast, and ranges over $48^\circ 46'$ of longitude, with a linear development of about 4,225 kilometres, or 2,625 st. miles. The triangulation is supported by ten base



O. H. Tittmann, Superintendent,
U. S. Coast and Geodetic Survey.

lines with an aggregate length of $53\frac{1}{2}$ st. miles, the longest or Yolo base being 10.9 miles in length; one-half of these lines having a smaller probable error of measure than one part in a million. A

* U. S. Coast and Geodetic Survey; H. S. Pritchett, Superintendent. The Transcontinental Triangulation and the American Arc of the Parallel. By C. A. Schott, Assistant, Coast and Geodetic Survey, Washington, D. C., 1900.

characteristic of the triangulation is its rigidity imparted to it by quadrilaterals and other polygons. In crossing the Rocky Mountains many of its sides exceed one hundred miles in length, and there is one side reaching to a length of 294 km., or 183 st. miles; the altitude of many of the stations is also considerable, reaching to 4,300 metres, or 14,108 feet, in the case of Pike's Peak, and to 14,421 feet at Mount Elbert. All geometrical conditions subsisting in the triangulation are satisfied by adjustment, inclusive of the required accord of the base lines, so that the same length for any given line is found no matter from what line one may start. This involved much heavy work; for instance, the triangulation adjustment between the Salina and the El Paso base demanded the simultaneous solution of ninety-nine normal equations (with as many unknowns). In addition the figures required the evolution of a correction to each of the two hundred and twenty-five observed directions.

Coming to the astronomical measures, we have distributed over or near the arc one hundred and nine latitude stations, occupied almost exclusively with zenith telescopes; there are, also, seventy-three azimuth stations, various methods having been used, and lastly we have twenty-nine telegraphically determined longitudes. These, of course, are of paramount importance for an arc of the parallel. There cannot be too many longitude stations in

consequence of that great stumbling-block in geodesy, the local deflections of the vertical or plumb-line. These deflections of the zenith from a normal direction have been divided into two groups: Those which are regional or manifest themselves with marked common features over thousands of square miles, and those which are quite local and greatly depend upon the surface features immediately surrounding them.

These deflections, even in level countries, average about 2.5"; but in mountainous regions this deflection is greatly surpassed. Thus we find for deviation of the plumb-line at Patmos Head station 12" to the north, at Colorado Springs 25" to the west, at Salt Lake City about 17", and at Ogden about 15" to the east, at Genoa Station, Nev., nearly 29" to the west, the quantities depending to some extent on the spheroid of reference; but their amount and direction are obviously well accounted for by the position of the known attracting masses. In connection with this, continental attraction may manifest itself and be recognized by the astronomical amplitude of the longitudes of extreme stations of a long arc being in excess of the corresponding geodetic amplitude. The matter cannot be further pursued here in detail, but it may suffice to state that the average curvature of the equipotential surface of the geoid along the parallel of 39° approaches for about four-sevenths of the arc from its eastern

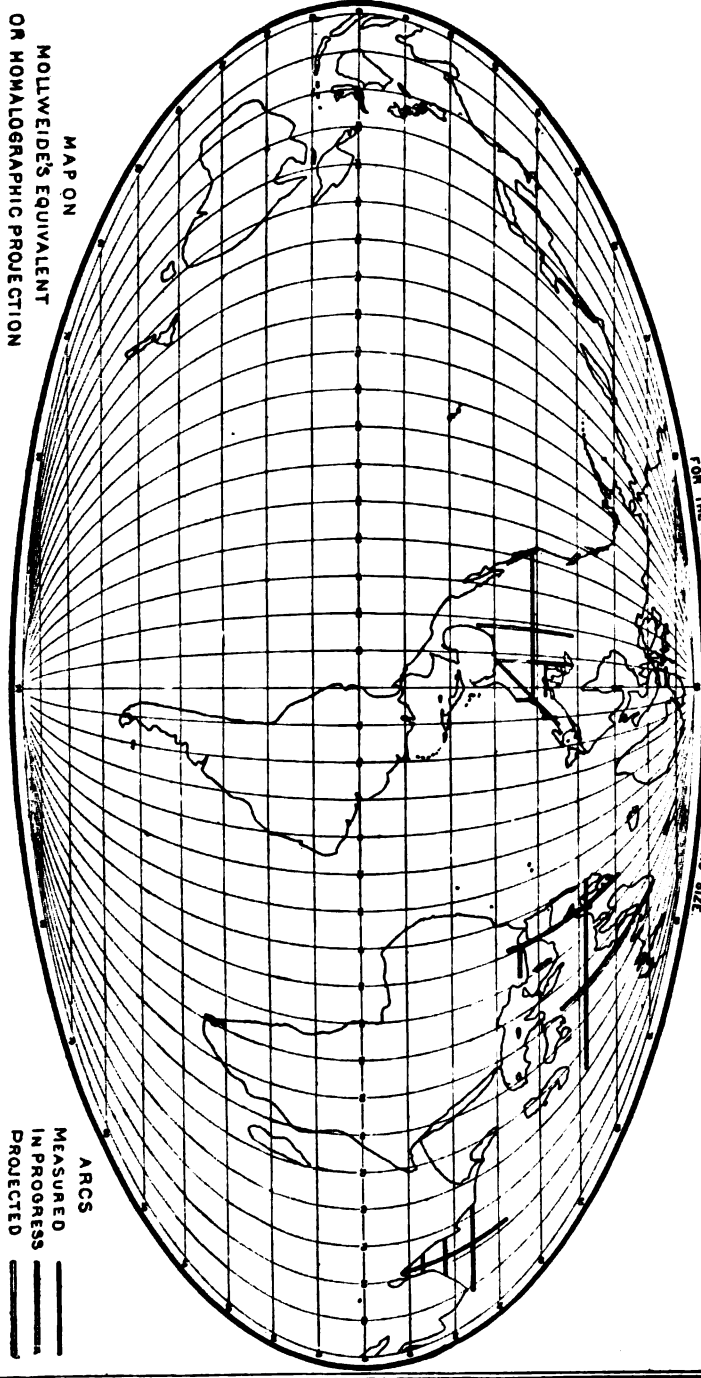
A NOTE CONCERNING THE CHART ON THE OPPOSITE PAGE

THE value of the Chart of the World, shown on the opposite page, is that the areas of all parts of the world appear in true proportion.

The projection is the invention of Professor C. B. Mollweide, in 1805; numerous applications of it were made by Babinet in 1857, which gave rise to his name being attached to it under the designation Babinet's homolographic projection. It is an equal surface projection in which the entire surface of the earth is represented enclosed within an elliptic outline, whose major and minor axes represent the equator and central meridian respectively, with a ratio of 2 to 1. The parallels are straight lines, and the meridian, ellipses, and each zone or subdivision of the projection is in due proportion to the corresponding area on the sphere. The distances of the parallels from the equator-line are computed from the formula characteristic of the projection. C. A. S.

PRINCIPAL ARCS OF THE MERIDIAN, THE PARALLEL AND OBLIQUE ARCS.

FOR THE MEASUREMENT OF THE EARTH'S FORM AND SIZE.



MAP ON
MOLLWEIDE'S EQUIVALENT
OR HOMOLOGRAPHIC PROJECTION

ARCS
MEASURED
IN PROGRESS
PROJECTED

end closely to that of the Clarke spheroid; whereas, for the remaining three-sevenths, or for the region across the Rocky Mountains to the Pacific, the curvature comes more nearly to that of the Besselian spheroid. In the published paper two tables are given containing the results needed for combination with any other arc and, in conclusion, some preliminary rough combinations of American arcs are presented; all of which point to a reference spheroid of larger dimensions than those of the Besselian and are in favor of continuing the use of Clarke for reference.

The second arc under consideration extends from Calais, Me., in the northeast and opposite the Canadian boundary, to the Gulf of Mexico, and terminates at New Orleans, La. It is known as the Eastern Oblique Arc of the United States. Its length is 2,612 km., or 1,623 statute miles; its difference of latitude is $15^{\circ} 1'$, and of longitude $22^{\circ} 47'$. The general direction is, therefore, favorable and the length ample to secure fair results for an osculating spheroid. In the main the triangulation follows the Appalachian chain of mountains; in Western North Carolina and Eastern Tennessee it bifurcates, leaving an oval space between the two branches. The length of sides depends upon six base lines, and in general the development is closely accommodated to the hypsometric and other natural conditions along the course. It includes among its stations the two highest points in the eastern part of the United States, viz., Mount Washington, N. H., rising to about 1,920 metres, or 6,300 feet, and Mount Mitchell, N. C., rising to about 2,038 metres, or 6,687 feet.

The adjustment of the whole triangulation is effected precisely as explained in the use of the arc of the parallel; the small reduction to the sea-level of the observed horizontal directions, on account of the altitudes sighted, was only applied when exceeding $0.05''$. The principal labor of adjustment was demanded

by the necessity of bringing into accord the measured lengths of the Fire Island, the Massachusetts and the Epping base lines, and fulfilling the geometrical conditions of the intervening net of triangles. This demanded the satisfying of fifty-seven conditions and involved the simultaneous solution of an equal number of normal equations and the working out of one hundred and thirty-one corrections of observed directions. Of astronomic measures we have seventy-one latitude stations, seventeen longitude stations, and fifty-six azimuth stations, tolerably well distributed over the whole extent of the arc. The latitudes, as were those of the arc of parallel, were corrected for height of station or curvature of the vertical and for variation of pole according to Dr. Chandler's and Dr. Albrecht's researches. The same scrutiny as before had been extended to the deflections of the vertical, both regional and local. Partly on account of avoiding unnecessary labor, but principally on account of the crowding together of astronomic stations in certain very limited localities, and all of them, therefore, partaking of the deflections characteristic of this area, the total number of astronomic stations admitted into the final equations for the determination of the best spheroid were thirty-six for latitude, fourteen for longitude, and thirty-four for azimuth, or eighty-four conditions in all.

These eighty-four differences between the astronomic and geodetic results constitute the data needed for a new determination of a spheroid; next the functional relations between the positions of these stations upon the reference spheroid to the earth's equatorial radius and to the compression of the polar axis had to be established.

The final normal equations contain, therefore, four unknown quantities, viz.: the correction to the meridional deflection of the vertical at the initial or reference station of the oblique arc; second, the corrections to the deflection of the ver-

OUR KNOWLEDGE OF THE EARTH'S SHAPE AND SIZE 41

tical, in the plane of the prime vertical, at the same place; third, correction to the equatorial radius of the reference spheroid; and, last, the correction to its compression.

In the combination of conditional equations arising from observations of a different nature, the question of their relative weights must be considered. In the present case, four assumptions were made and the consequent normal equations solved, viz.: for equal weights, for weights one-half, one-third, and one-fourth to the azimuth equations, the latter being necessarily inferior to the equations derived from latitudes and longitudes. A comparison of these four results showed that it was of small consequence which of these hypotheses was finally adopted, since the corrections to the equatorial radius of the reference spheroid were practically the same for any of these hypotheses, and nearly the same could be said of the resulting compressions. The weight one-third to each of the azimuth equations was finally decided upon, and the resulting dimensions of an osculating spheroid were found to be: Equatorial radius, $6,378,157 \pm 90$ metres; compression,

$1/304.5 \pm 1.9$. The equatorial radius, therefore, differs but forty-nine metres from Clarke's value of 1,866 adopted on the Survey, while the Besselian value is apparently too small by eight hundred and nine metres. On the other hand, the compression or the ratio of the difference of the equatorial and polar semi-axes to the former is in favor of Bessel's spheroid, of which the compression is $1/299.2$; that is, one more closely approaching a sphere.

In the present state of our knowledge there is no reason to suppose that the curvature of the northern part of America differs any more from that of a general spheroid derived from arcs of all kinds so far measured than local ones in either hemisphere differ among themselves. A comparison of a number of such locally adopted spheroids will bring to evidence the local deformities in the shape of the earth's equilibrium surface and furnishes the geodesists endless material for the study of the earth's actual figure.

The manuscript concludes with a comparative table of the dimensions of several spheroids which of late have come more into prominence. It is as follows:

Spheroid of	Equatorial radius, a , in metres.	Polar semi-axis, b , in metres.	$a - b$.	Compression $(a - b)/a$.
Bessel, 1841. From ten arcs of the meridian and total amplitude $50^{\circ} 34'$	6,377.397	6,356.079	21,318	$1/299.15 \pm 3.15$
Clarke, 1858. Special spheroid for surface of Great Britain and Ireland; range of latitude 12° , the same in longitude; seventy-five astronomic stations	$6,378,494 \pm 90$	6,355,746	22,748	$1/280.4 \pm 8.3$
Clarke, 1866. From five meridional arcs, of total amplitude $76^{\circ} 35'$	6,378,206	6,356,584	21,622	$1/295.0$
Clarke, 1880. From five meridional arcs and longitudinal measures, total amplitude $88^{\circ} 59.8'$ (equatorial degrees)	6,378,249	6,356,515	21,734	$1/293.5$
United States Coast and Geodetic Survey, 1900. Eastern oblique arc of the United States; total length, $23^{\circ} 31'$, and eighty-four astronomic stations	$6,378,157 \pm 90$	6,357,210	20,947	$1/304.5 \pm 1.9$
Harkness, 1891. From "The Solar Parallax and Related Constants," Washington, 1891, p. 138. From a variety of sources	$6,377,972 \pm 125$	$6,356,727 \pm 99$	21,245	$1/300.2 \pm 3.0$

N. B.—The $\pm$ indicates probable errors.

EXPLORATIONS IN CENTRAL EAST AFRICA

DR. DONALDSON SMITH has returned to Philadelphia from a journey of 1,500 miles through Central Africa, from Berbera, on the Somali coast, to the Nile via Lakes Rudolf and Stephanie; the last half of the journey was over new country never before explored.

After considerable difficulties with the local officials, which involved the fitting out of three distinct expeditions, Dr. Smith started from Berbera on August 1, 1899. Owing to the desertion of his Sikh followers, he began to cross the Haud with only seventeen Somalis and as many Gurkhas and Sikhs, besides his assistant, Mr. Frazer, and a Goarnese cook. The expedition marched by way of Milmil, Sesahane, and Sheneli to the Shebeli River, the followers being increased to forty-eight on the way. The Shebeli was reached on September 8th at a spot called Godi, over four hundred miles from Berbera by road, and on September 11th the expedition started west again, and between Gohulle and El Dere followed the line of march traversed by Dr. Smith in 1895.

In the first journey he saw the worst side of the Abyssinian method of annexation, but his more recent observations showed him that the Abyssinians' treatment of tribes once brought thoroughly to submission was commendable. In the first attacks the Abyssinians were certainly very cruel, but later they restored to the natives a large proportion of their belongings and very nearly their original self-government, only a moderate tax being imposed. From the Somalis to the Boran he was surprised to find the natives quite as rich apparently as they were before they came under Abyssinian rule.

Leaving El Dere, which is about equidistant (750 miles) from Berbera and the Nile, the expedition marched through

broken and very wooded country, abounding in elephants, and here the Somali followers gave much trouble. They were never satisfied unless they had over ten pounds of camel meat or mutton a day each, and when food was scarce Dr. Smith had to be on the alert constantly to prevent them from poisoning transport animals or stealing sheep. But the Somalis were not such miserable thieves as most of the Indians, and their superb physical condition, swift-footedness, endurance, and intelligence were remarkable. Of the nine Gurkhas four only were pure blooded, and these were among the best men in camp. But the others, with some of the Sikhs, continually tried to hide if the march were long, and had to be hunted up. Two who evaded the search parties were never heard of again.

After leaving Goff, the expedition reached an altitude of over 5,000 feet in the Boran highlands, when suddenly the caravan was brought to an abrupt halt by a precipice that sheered off almost perpendicularly to a broad plain 1,700 feet below. Five marches were occupied in crossing this plain, where Dr. Smith obtained a specimen of a tiny gazelle which had been proved to be new to science.

On November 26th the valley of Lake Stephanie was entered, and here the expedition endured much hardship by the burning of the camp and the shortness of water, for the water of the lake was found to be so briny that it was undrinkable. Lake Rudolf was reached on December 10th. The formerly rich tribe of Rusia was found no longer to exist, and no human beings were seen until the river Nianam was reached.

A remarkable change in the fauna was now observed. Between the Nianam and the Nile there was not only a completely different set of birds, but scarcely any of

the mammalia were the same as had been found in the eastern section of the journey. On January 3d the Omo River was left behind. It was now found that as the expedition approached, the natives fled to the hills and seemed inclined to fight. They appeared to be a branch of the Turkana. One day a number of them attacked two of Dr. Smith's camels, and were only driven off by firing; but this was the only case of attempted hostilities on the whole journey.

After leaving the highlands and crossing at right angles the line of march of the late Captain Wellby, the Magois were encountered. They have the heavy build and large features, with high cheekbones, of the Soudanese, and, above all, the lines of raised tattooing on their cheeks that is so typical of the people about the Nile. Dr. Smith thinks it not unlikely that they are a branch of the Dinkas, who, perhaps being driven from the Sobat by the Neurs, put the desert between themselves and their persecutors. They seem to care principally for small red beads, and work them in gorgeous patterns on leather plaques, with which the warriors adorn their massive dead-dresses.

The most *outré* of our fashionable young men can never aspire to the height of collar worn by some of the Magois. Their collar of beads throws the chin high up in the air, and their locks are done up in a great chiffon, composed principally of clay covered with ostrich feathers. Parallel lines of raised tattooing on the chest and abdomen, leopards' skins hung over the back, and a bell hung on a slender cord around the waist help to enrich the men's apparel. They are the only people Dr. Smith has ever seen wearing a zebra's tail suspended from the elbows. Many of the younger girls have rather attractive features and pretty figures. The worst burden they have to carry in life seems to be the countless necklaces of beads which spread over

their bosoms to the waist, and the large bracelets and anklets of ivory, brass, and iron. Their hair is shaved above the ears and cut fairly close on the top of the head.

Contrary to the advice of these natives the expedition set out into the plain westward, and here they suffered much from the difficult ground and the scarcity of water, and many transport animals and much valuable baggage were lost. After searching for a better route, for many days, a branch of the Magois calling themselves Katua were encountered, and Dr. Smith was surprised to find them cow-worshippers, indulging in certain rites supposed to be peculiar to the Hindu religion. On reaching the most northern extension of the Uganda highlands on February 15th, the Akara were met with. Many of these natives were agriculturists as well as stock-raisers, and had substantial wooden dwellings. Villages were passed which might easily have contained 1,500 inhabitants. Dr. Smith secured at this stage of the journey the only specimens ever obtained of the spotted bushbuck. On March 2d Lockall was reached, and there Dr. Smith received a visit in state from King Amara, who commanded perhaps 25,000 warriors. Fort Berkeley was reached on March 14th last. As no steamers had come up, however, the followers of the expedition had to be sent down to Mombasa after waiting a month. But on May 5th a gunboat arrived and Dr. Smith and his collections were carried down to Cairo. That site was reached just ten months after the departure of the expedition from the Somali coast.

Dr. Donaldson Smith has not only thoroughly explored a large tract of Africa, but he has made a most valuable series of surveys and some very interesting collections. Dr. Smith has earned a very high position as an explorer of unknown countries, and deserves the warmest praise of geographers.

GEOGRAPHIC NOTES.

THE DUKE OF ABRUZZI.

THE Duke of the Abruzzi will despatch from Christiania in the spring a relief party to search for the three members of his North Polar expedition who were lost in March, 1900. These were Lieutenant Querini, a Nor-



Lieut. Franco Querini.

wegian engineer, and an Italian machinist. Captain Cagni's party set out from Teplitz Bay, $82^{\circ} 4'$, where the *Stella Polare* was blocked, March 11th, and during the first nine days advanced 43.5 miles. As the party was too numerous for rapid advance, he determined at this point to send back the three men whom he judged were least able to stand the strain of march-

ing. It had been agreed when Cagni and the Duke separated that only those most enduring and competent should continue with Cagni on the march. The three were started back in good spirits, good health, and abundantly provided with provisions, but they were never heard from again. Captain Cagni believes that they must have fallen into a chasm and perished. Letters were left at Teplitz Bay with instructions for the men to proceed to Cape Flora. Provisions sufficient for twenty men for three years were also left with the letters and enough more for three men for four years at Cape Flora.

The preliminary report of the expedition recently published by the Duke of Abruzzi in the Italian *Militare e Marina* has added but little to the account already given in the NATIONAL GEOGRAPHIC MAGAZINE (vol. xi., pp. 411-413). The advance of Cagni is especially remarkable for the speed which his party was able to maintain. For days they averaged 9.5 miles in twenty-four hours, a phenomenal rate of advance over polar ice and snow. Latitude $86^{\circ} 33'$ was reached April 26th. No land was here in sight, nothing but ice in a state of thaw. Petermann's Land, which Payer believed he saw, did not exist where he stated or Cagni would surely have seen it early in his journey. The same must be true of King Oscar Land.

TRANS-SIBERIAN RAILWAY.

WORK will be resumed on the branch of the Trans-Siberian railway from Stretensk to Khabarovsk. This route was abandoned for a more direct line to the Pacific through Manchuria when Russia acquired

practical control over Manchuria after the Chino-Japan war. The disturbances in this province during the past summer have shown the Russian Government that for a number of years the route through Manchuria is liable to be cut by bands of Chinese at any moment. Hence if there is to be regular railway service from St. Petersburg to the Pacific a safer route must be maintained. The northern route, which is a part of the original plan, follows the left bank of the Shilka and Amur Rivers and thus keeps entirely in Russian territory. It protects and is in turn protected by the line of Russian steamers and barges which regularly ply up and down the Shilka and Amur between Stretensk and Khabarovsk.

NATIONAL GEOGRAPHIC SOCIETY LECTURES.

THE National Geographic Society announces the following lectures: "The Explorations and Missions of the Franciscan Fathers in Mexico," by J. Stanley-Brown, Friday, January 4th; "The Routes for an Isthmian Canal," by Arthur P. Davis, Friday, January 18th; "The Characteristics, Recent Progress, and Present Condition of Mexico," by Señor Dr. Don Juan N. Navarro, Mexican Consul-General at New York, Friday, February 1st. These lectures are held in the Congregational Church, at eight P.M. Technical meetings for the reading of papers and general discussion will also be held on the evenings of January 11th and 25th. The place of meeting and subjects will be announced later.

SVEN HEDIN.

IT was feared that Sven Hedin had lost his life in the chaos throughout the Chinese Empire during the past summer. But he has reached his headquarters, Yangi-Koll, Central Asia, safe

and sound, and is as enthusiastic and vivid in his descriptions as ever. He reports that he has passed the summer, unmolested, in the vast Desert of Gobi.

It will be remembered that Sven Hedin went to Central Asia in August, 1899, purposing to stay three years there verifying and continuing the explorations he made in that region during 1893-1895. His narrative of those years, *Through Asia*, has been published in half a dozen languages, and has made him world-famous as one of the great explorers of history, comparable to Marco Polo, von Richtofen, and Livingston.

Dr. Hedin writes that he has definitely located the original bed of the mysterious and shifting Lake Lobnor, about the location of which geographers have so long wrangled. Along the south end of the lake once ran the ancient caravan route from Central China westward, formerly thronged with camels carrying silk to the markets of the west. On the banks of Lake Lobnor were found the ruins of houses, temples, and watch-towers, evidently the remains of a city rich and prosperous 2,000 years ago. The rivers in that region are very perceptibly drying up at their southern ends, Dr. Hedin states, and growing bigger and bigger at the north. He concludes that the hydrographical system is moving toward the northeast.

THE COAST OF PORTO RICO.

THERE was no relaxation in the activity displayed by the United States Coast and Geodetic Survey in its surveying operations in Porto Rico during the summer of 1900. During the season thirty-six triangulation stations were occupied and one hundred and one geographical positions located. A base line was measured and an azimuth determined. Large scale surveys were made of the approaches and surroundings

of Guanica Bay and Mayaguez, and a small scale survey of that portion of the main mountain range visible from the south coast. The difficulties of the work may be imagined when it is stated that for several hours each day, for nearly three months and a half, it was necessary for the topographer and his aids to work in water almost waist deep.

THE CENSUS OF INDIA.

THE third general census of India will be taken on the night of March 1st. Ten years ago the population of India was about 287,000,000, but this census will probably show not more than 300,000,000, as the ravages of famine and cholera during the past decade have been great. In other words, the increase of population in India during 1891-1901 is estimated at about the same as the increase in the United States during the same period, though the latter had less than one-fourth as large a population as the former. The immensity of the task involved in counting the people of India, one-fifth the population of the world, may be grasped by comparison with the immense work of taking a census of the United States. Nearly a million men and boys will be employed as enumerators, clerks, etc. The well-known suspicion and reluctance of the Indian people to answer the questions of the census taker are gradually wearing away, and the Indian Government confidently hopes for good results from the census of 1901.

LAKE TANGANYIKA.

CONVINCING evidence of the shrinking up of Lake Tanganyika was presented in a paper recently read in Brussels by Captain Hecq. The post of Karema was built twenty years ago on the shores of the lake, but when Captain Hecq last visited the place, a few

months ago, the waters had so receded that the post was fourteen miles distant from the lake. The slave-trade in the vicinity of Lake Kivu is dead. Domestic slavery, however, Captain Hecq states, still continues, but will soon disappear.

A REPUBLIC IN MAN- CHURIA.

A FLOURISHING little republic in Manchuria, it is asserted, has been discovered by the Russians. It lies along the upper reaches of the Sungari River, below Kirin, which is on the line of railway from Onon to Port Arthur. The Government, according to report, is properly organized with a President, Courts of Justice, Trade Guilds, tax collectors, and other officers of a State. It supports a small army, which last summer joined the Chinese forces to oppose the Russian advance, and fought with much valor. Probably the Republic was founded seventy years ago. It now numbers about 100,000 and, oddly enough, has always been favored by the Imperial Government.

ORGANIZATION OF FRENCH CONGO.

BY a recent decree of the French Government a new administrative province has been formed in North Central Africa, entitled "Territoire Militaire des pays et protectorats du Tchad." It includes the basins of the Kemo, a tributary of the Ubangi, and of the Shari, and also Wadai, Bagirmi, and Kanem, which by the Anglo-French agreement of 1899 were included in the French sphere of influence. The object of this organization is to enable France to cease sending military expeditions to this region. All the soldiers henceforth of this province will be natives, officered, of course, by Frenchmen.

THE FORESTS OF THE PHILIPPINES.

THE Philippine Bureau of Forestry has submitted its first report on the forest wealth of the Philippine Islands.

The Bureau was organized by order of the Military Governor, April 14, 1900, to ascertain the condition of the forests and the regulations adopted by the Spaniards for their preservation.

It is estimated that from one-fourth to one-half the area of the Philippine Islands, or from twenty to forty million acres, are public forest lands. In the islands of Mindoro and Paragua at least 5,000,000 acres of virgin forests are owned by the State.

The island of Mindanao with an area of 20,000,000 acres, is almost entirely covered with timber. Even in the province of Cagayan, Luzon, there are more than two million acres of forests. In some of the southern islands magnificent tracts are standing with from 10,000 to 20,000 cubic feet an acre of splendid timber. The trees tower to a height of one hundred and fifty feet, often shooting up sixty feet without a single branch and of a diameter of four feet.

Captain Ahern, Director of the Bureau, believes that there are as many as five hundred species of trees in the archipelago. No pure forest of any one species exists. Rarely do more than three or four trees of one variety grow together. Many varieties of valuable gum, rubber, and gutta-percha trees are found; also seventeen dyewoods and the ylang ylang from whose blossoms so many perfumes are made.

It is stated the regulations adopted by the Spanish for the preservation of the forests of the Philippines were in line with the most advanced forestry legislation of Europe. But these rules were not enforced. The men licensed to cut, hewed indiscriminately; with the result that the most valuable rubber, gutta-percha, and ylang ylang trees were used for firewood.

The old regulations have been revised by Captain Ahern. Lumbermen are now licensed to cut only certain species.

SOUTH POLAR EXPLORATION.

THE arrangements for the British and German South Polar Expeditions which sail from Europe in August, 1901, are nearly completed. It is expected that the English boat, the *Discovery*, will be launched in March at Dundee. She is a good strong boat, built on different lines from the *Fram*, for the latter was planned to resist, or rather escape, tremendous ice-pressure, while the *Discovery* was modelled to withstand the attacks of a boisterous sea. The German boat, building at Kiel, is smaller and lighter than the *Discovery* and follows somewhat the lines of the *Fram*.

The two ships sail from Europe together. The official statement of their plan of co-operation is as follows:

"When they reach the far South they will separate with a carefully arranged plan of work for each. The Antarctic regions have been divided into four quadrants. First, the Victoria quadrant, which extends from 90 degrees east to 180 degrees, and includes Victoria Land; second, the Ross quadrant, from 180 degrees to 90 degrees west, south of the Pacific Ocean; third, the Weddell quadrant, from 90 degrees west to 0 degree (Greenwich meridian), the Weddell Sea; and fourth, the Enderby quadrant, from 0 degree to 90 degrees east, which includes Enderby Land. Two quadrants have been assigned for exploration and research to each expedition, the British taking the Victoria and Ross, and the German the Weddell and Enderby."

Both expeditions hope to be able to spend three years in the work. Captain Drygalski, the famed explorer of Greenland, leads the German party, while Captain Scott of the British Navy, young, hardy, and level-headed, directs the English.

THE PRINCIPLES UNDERLYING THE SURVEY OF THE BOTTOM OF THE OCEAN FOR AN ALL-AMERICAN TRANS-PACIFIC CABLE TO THE PHILIPPINES AND THE ORIENT.

THE object of such a survey is so to develop the mountain systems of the bottom of the ocean that every large change of elevation will be disclosed and allowed for in the laying of the cable; and the problem therefore is to determine the intervals at which deep-sea soundings should be taken in order that important mountain systems may not escape detection and subsequent development.

The survey consists of two main parts: first, direct lines of soundings spaced at alternate intervals of ten and two miles passing between the successive landing stations at Honolulu, Midway, Guam, and Luzon, and also between Guam and Yokohama in Japan; and secondly, of sounding stations, twenty miles apart, at the turning points of a zigzag route passing back and forth to equal distances on each side of the direct lines of soundings.

The direct lines were run in passing to the westward from California to the Orient, and they give the general contour of the bottom. The zigzag lines were run in returning to the eastward for the purpose of giving breadth and configuration to the forms indicated as a result of the depths measured along the direct lines. This distribution of soundings was adopted as a result of a theoretical investigation giving the equation to the curve which, by revolution around a vertical axis, would generate the sur-

face of an isolated submarine peak in which the crushing strength at any cross-section is equal to the combined weight of the formation above that section and of the superincumbent body of water.

Taking the origin of co-ordinates at the apex of the peak, and the axes of y and x to be vertical and horizontal respectively, the equation to the generating curve would be $y = \frac{\kappa}{\delta} + \frac{2\delta'}{\delta} \log x$,

in which κ represents the coefficient of crushing strength of the materials composing the crust of the earth, δ the average density of these materials, and δ' the density of sea-water. The shape of the formation thus described resembles the form of the Eiffel Tower, but is much flatter in proportion to its height.

From the investigation of its properties it appears that the radius which a prominent orographic feature can have at the sea-bottom may be stated to be ten miles. An interval of ten miles coupled with an interval of two miles is the very longest that would be sufficient for general development, but these intervals are small enough to prove with certainty the existence or absence of any formation rising close to the surface of the deep sea.

Of all the possible ways in which a ten-mile interval could lie with reference to a submerged peak, that which would be most advantageous for a prompt discovery is the condition in which one end of the interval is at the bottom of the slope and the other near the apex, and that which would be least advantageous is the condition in which the interval is bisected by the position of the apex. In the latter case there would be nearly equal soundings at both ends, but the soundings at the ends of the adjacent two-mile intervals would immediately disclose the slopes.

E. W. LITTLEHALES.

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THE NATIONAL GEOGRAPHIC MAGAZINE

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Editor-in-Chief: JOHN HYDE

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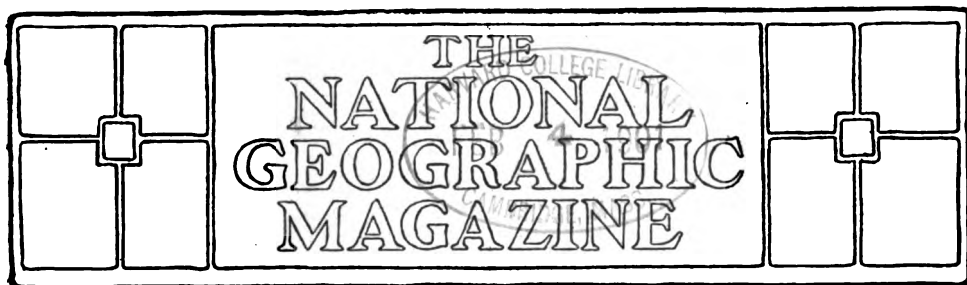
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AN AROUND-THE-WORLD AMERICAN EXPOSITION

BY HON. O. P. AUSTIN, CHIEF OF THE BUREAU OF STATISTICS

A FLOATING exposition, carrying samples of our merchandise around the world and putting our merchants in touch with those of all nations, seems to me a fitting American enterprise for the beginning of the new century. The nineteenth century has made the United States the greatest exporting nation of the world; why not begin the twentieth by showing to all the world what we have to sell and how we can sell it?

Exhibitions of the products of industry have proved beneficial to trade wherever undertaken, whether the ancient "fair" or the more modern "exposition." The traveling salesman with his sample cases has become a necessity of modern mercantile success; "commercial museums" exhibit to the dealers of one country the class of goods required in other lands, and the great European nations now send out "commercial missions" to inquire into and report upon the trade opportunities in distant countries.

But each of these methods has its limit of influence. The fair or exposi-

tion is dependent for its success upon the number of people it can attract to its doors, the traveling salesman represents but a single establishment or industry, the commercial museum conveys its information only to the seller and not to the buyer, and the commercial mission gathers information regarding the wants of distant people, but is unable to offer them samples of the goods which its own people have to meet those wants.

Why not combine the valuable features of these various aids to commerce in a single great enterprise—a "floating exposition," which shall carry samples of our merchandise to the very doors of the people whose trade we would foster, and by bringing the buyer and seller into personal contact, establish such mutual understanding of wants and conditions as to facilitate the interchange for which each is desirous?

FIELDS AWAITING AMERICAN ENTERPRISE.

The imports of Asia, Oceania, Africa, and the American countries south of the

United States amount to over two billion dollars every year. Nearly all of these importations *are of the very class of goods which we want to sell*—foodstuffs, textiles, mineral oils, machinery, and manufactures of all kinds; yet our sales to these grand divisions in the best year of our commerce, 1900, only amounted to about \$200,000,000, or 10 per cent of their purchases. The annual imports of Asia and Oceania are over a billion dollars, those of Africa over four hundred millions, and those of the countries lying south of the United States about six hundred millions.

Most of the cities through which these two billion dollars' worth of goods are first distributed lie on the seacoast, and could be readily reached by a fleet of vessels loaded with samples of American products and manufactures. It is well known that the lack of practical knowledge as to the local trade requirements, such as methods of packing, kind of goods required, length of credit, etc., is the chief obstacle to the introduction of American goods in these countries, and that until this obstacle shall have been overcome we cannot expect to obtain the share in that trade to which our location and facilities of production and manufacture entitle us.

If a floating exposition were systematically organized, loading one vessel with exhibits of foodstuffs, another with textiles, another with agricultural implements and vehicles, another with manufactures of iron and steel, another with household requirements, and another with "Yankee notions," and sent from port to port and continent to continent, it should prove highly advantageous to our commercial relations with all of the countries visited.

Every manufacturer or exporter sending an exhibit would naturally send with it a capable representative, who could discuss with the local merchant the qualities of his goods and their fitness or unfitness for local markets.

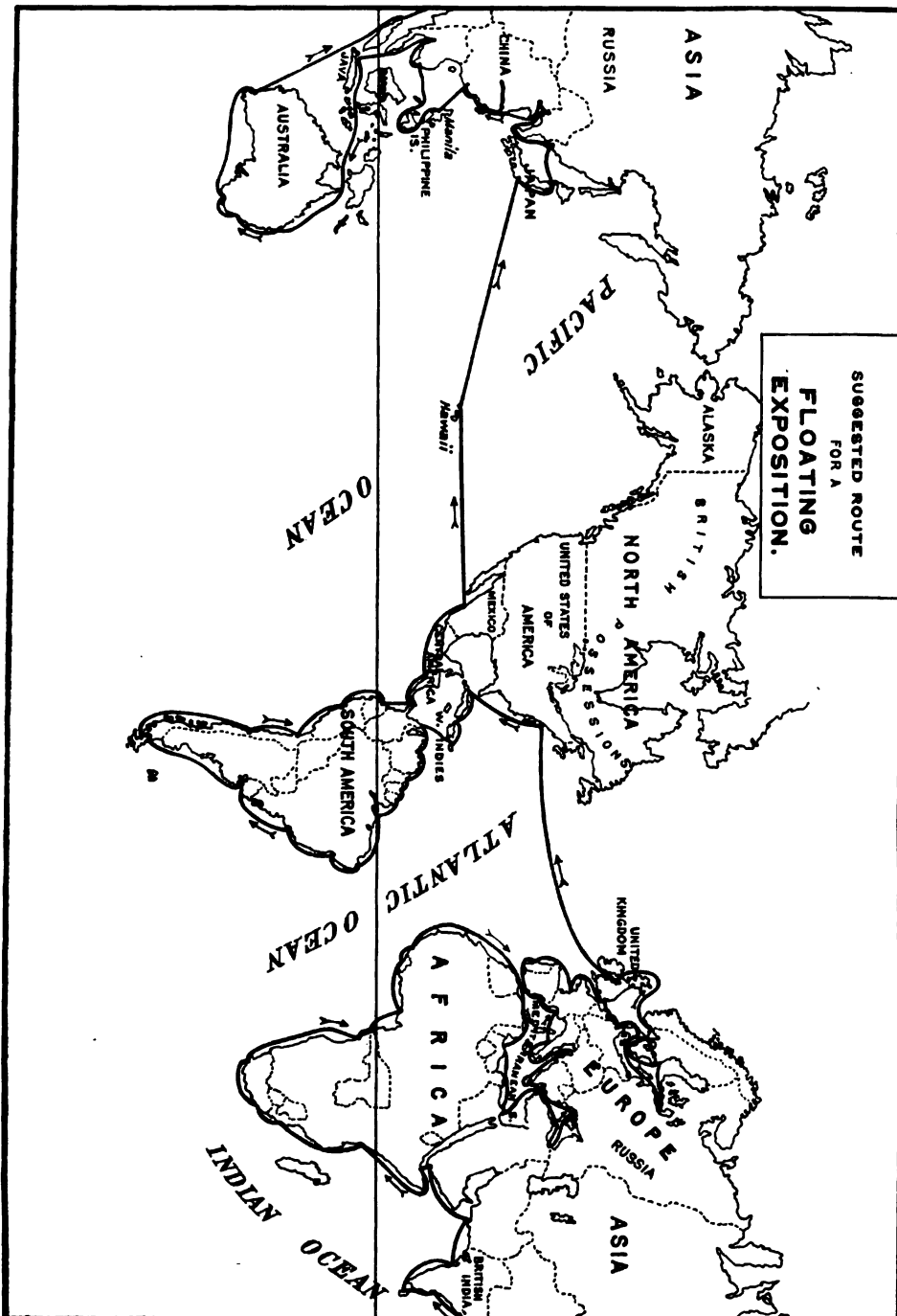
The coming of an exhibition of this character would attract at each port not only the business men of that city, but those of other commercial centers in the vicinity, and by this process the wholesale merchant of the United States would speak face to face with those of every country visited, and in these discussions would learn in a practical way the obstacles which now prevent a free interchange of commerce and the methods by which they can be overcome.

In addition to this, a corps of experts could gather samples of the goods now being sold in the countries visited, the prices obtained, the length of credit given, the banking and exchange facilities existing and required, and other facts which would prove valuable not only to those directly participating in the enterprise, but to all manufacturers and merchants of the United States, by their exhibition in commercial museums and by published reports.

THE FINANCING OF A FLOATING EXPOSITION.

The financing of an undertaking which contemplates sending a fleet of a half dozen vessels for a two years' voyage around the world appears at first sight a serious problem; but present conditions seem to be exceptionally favorable.

The producers, manufacturers, and merchants of the United States are greatly interested in the extension of markets for American goods, and the Bureau of Statistics is daily besieged with inquiries for information bearing upon this subject. The past three years have been exceptionally successful, and yet have shown the necessity of finding an increased outlet for the surplus which the American manufacturers show themselves capable of producing, and it seems not unreasonable to believe that they would look upon a reasonable expenditure for the extension of trade as money well invested. A great world's fair has



just been held at Paris, at which many Americans made exhibits, some parts of which would be suited to a floating exposition such as has been suggested. A great exposition, especially intended to apply to the people of Central and South America, is to be held at Buffalo this year, and its exhibits would in many cases prove a basis for an undertaking of this kind, while another exposition, especially relating to the West Indian trade, is to be held at Charleston. Thus, in the disposition to extend our commerce, in a prosperity which warrants new business ventures, and even in the partial preparation of exhibits, the circumstances appear to be especially favorable.

But there is still another condition which seems even more opportune and advantageous. The Government is the possessor of a considerable number of safe and seaworthy merchant vessels purchased as transports during the war with Spain, for many of which it will not have active use after the close of hostilities in the Philippines. If some of these vessels could be utilized for this work the problem, as to cost, would be greatly simplified.

Congress has always dealt liberally with expositions intended to improve our commerce, either at home or abroad, and it seems not unreasonable to suppose that if applied to by a proper business organization it might loan the necessary vessels for an enterprise of this kind. The appropriations of money made by Congress in behalf of expositions at home and abroad in the past 25 years amount to over \$10,000,000, and in view of this it would appear probable that an appeal from a properly organized association of business men might meet with favorable consideration.

If there could be added to this fleet of five or six merchant vessels a naval vessel or two to convoy the fleet around the world and add to its attractiveness and dignity, the success of the enterprise, in-

telligently managed, should be assured. The chief expense which the ordinary exposition must undergo is the erection of buildings. The construction account of the World's Fair in 1893 was 70 per cent of the entire cost. With this expense obviated by the loan of vessels, if they could be so obtained, the cost of the undertaking would lie chiefly in the coal consumed in passing from port to port, and in the force of men necessary for the management of the vessels, and this might also be small in case Congress should accompany the loan of the vessels with a suitable detail from the military or naval force for their management.

Whether the expense should be borne solely by those participating in the exhibition in proportion to the space they might occupy, or be met in part by a small charge for admission could be determined by those guaranteeing the expense of the enterprise. In the ordinary exposition the chief receipts are from admissions, and these are drawn entirely from the population of the city where the exposition occurs and from those visiting that city for that purpose, while in the case of a floating exposition visiting great cities in various parts of the world the local population which could be appealed to would aggregate many millions.

THE ROUTE FOR A FLOATING EXPOSITION.

The route which a floating exposition might determine for itself would be bounded only by the limits of the great seas upon which it would float. Starting from the eastern coast of the United States, it would perhaps make its first stop at our new possession, Porto Rico, thence to Cuba and other of the West Indies, thence to the principal cities on the eastern coast of Central and South America, thence along the western coast of America, then to the Hawaiian Islands,

Japan, Korea, Asiatic Russia, the coast cities of China, the Philippines, Siam, the Dutch East Indies, Australia, the Malay Peninsula, India, Persia, Arabia, the eastern and then the western coast of Africa, then a tour of the Mediterranean and the cities of western Europe,

and thence back to the place of origin, occupying two or perhaps three years, and meantime carrying the American flag and American enterprise to every part of the world. Why not an Around-the-world American Exposition to inaugurate the twentieth century?

THE CAUSES THAT LED UP TO THE SIEGE OF PEKIN

BY DR. W. A. P. MARTIN

I HAVE been asked to give some account of the siege in Peking, together with the causes that led up to it, and its probable outcome. No proper view of the thrilling events which have there taken place can be given without first touching upon the *geographical situation*. Man is moulded by his environment, and it would not be difficult to show how the character of the Chinese—physical, moral, and intellectual—has been formed by the geography of their country.

Of England a well-known poet, after satirizing the villainous climate of his country, exclaims:

“’Tis thus, with rigor for his good designed,
She rears her favorite man of all mankind.”

A Chinese philosopher would unquestionably adopt without objection every word of the English poet, and he would lay special emphasis on the phrase “her favorite man of all mankind.” He reads in the ancient books of his own country a tradition that man was made not of dust, but of clay, the clay being of different colors. The Chinese were made first, and of yellow clay; hence they gave themselves the flattering designation of “Men of Gold.” That title

we find to have been a common one among the Tatars of the north. In the eleventh and twelfth centuries a large part of northern China was subject to a body of Tatars, who bore the tribal name of “Golden Horde.” The present rulers of China, called Manchus, claim them for their remote ancestors, and continue to wear the same title of “Golden Horde”—in the Manchu language “*Aischin Gioro*.”

SEVEN CENTURIES OF FOREIGN RULE.

The relations of the Tatars to the Chinese from time immemorial have been very similar to those of the Shepherd Kings to the rich inhabitants of the Nile Valley. The Chinese depended upon agriculture, while the wandering nomads of the northern plains subsisted on their flocks and herds without settled homes. They were always ready to make incursions into the bordering provinces of China, and oftentimes succeeded in effecting the conquest of a portion or the whole of the Chinese Empire.

It is startling to discover that one or other of these Northern tribes, Mongol or Manchu, has exercised the mastery over China for seven hundred out of the

last fifteen hundred years ; nor are the troubles caused by them limited to seven centuries, for the Great Wall, so huge as to form a geographical feature on the surface of the globe, attests a perennial conflict between Tatar and Chinese, for it was erected two hundred and forty years before the Christian era for the express purpose of keeping the Tatars out. That such a conflict should exist from generation to generation is no matter of surprise. Schiller tells us that it began not far from the Garden of Eden, and has been handed down from Cain and Abel to the present time. His version of the Bible story is that Abel's sheep trespassed on the cornfields of his brother Cain.

A Chinese historian says of the Great Wall: "It required so much labor for its construction that it was the ruin of one generation, but it was the salvation of all that followed." To me this appears to be an overestimate of its benefits; for while it has undoubtedly served the purpose of a barrier against small bodies of marauders, it has never sufficed to restrain great armies like those of Jenghis Khan. The Manchus, who for two hundred and fifty-six years have held the throne in Peking, were not under the necessity of forcing their way across this international barrier, but had its gates thrown wide open for them by a Chinese general, Wu San Kwei. He invited their assistance to suppress a body of rebels who had taken possession of the capital, and to revenge the crimes committed by them, an errand very similar to that of the eight powers now in occupation of China. The rebels were easily put to flight, but when the general offered to pay off his Tatar allies and invited them to retire to the north of the Great Wall, they respectfully declined to do so.

An old fable tells us that an ass, in danger of being driven from his pasture grounds by a horned stag, invited a primitive man to mount on his back and

drive away his enemy. When the stag was put to flight, he asked the man to dismount ; but he was an ass to imagine that the man would comply with his wishes.

China finds herself in the same predicament today. Instead of the Manchu-Tatars, ranged curiously enough under eight banners, she finds herself completely under the power of the eight mightiest nations of the globe. They are in the saddle, with their bit in the ass's mouth, and though that noble beast, like that of the ancient prophet, speaks with human voice, and utters an energetic protest, it remains to be seen whether some of these eight nations will not persist in keeping their place in the saddle.

The fact that China is and has been under foreign domination for two centuries and a half is essential to the comprehension of that astounding movement which has so engrossed the attention of the world.

What motives, we are asked, could prove themselves so potent in their effect on all classes in that empire as to bring about combined action of high and low for the expulsion of foreigners? I answer that there are three motives which, taken in connection with the circumstances of the age, appear to me to be sufficient to account for the phenomenon. They are: first, political jealousy, second, religious antipathy, and last, but not least, industrial competition. These have operated in different proportions on different classes, while in some instances all three have combined to produce their effect on the mind of one class. The existence of political jealousy is inseparable from a foreign domination.

The Manchu dynasty, though it has produced many able rulers, has never been free from the influence of that kind of jealousy. The Manchus have always feared, since the dawn of commercial intercourse with the great nations of the west, that some of those nations

would endeavor to supplant them in the occupation of China. They have accordingly been suspicious of everything, whether commerce, missionary enterprise, or railways and mines, which tended to increase the prestige of foreigners. Some of these undertakings they have looked upon as a preëmption claim on their territory; others as a settled scheme for winning away the hearts of their people. You will naturally infer that they have never shown themselves, with one exception which I shall presently mention, very solicitous for the intellectual enlightenment of their Chinese subjects.

The old philosopher, Laotse, lays down as a maxim for easy government, in satire no doubt, that it is only necessary to fill the people's bellies and to empty their skulls. On this the present rulers of China—I mean the Empress Dowager and her clique—are acting in the suppression of schools, the interdiction of newspapers, and the attempted extirpation of Christian missions.

THE REFORMS ATTEMPTED BY EMPEROR KWANG SU.

The exception is a remarkable one. It is the young Emperor, Kwang Su, who is in no degree responsible for hostilities with foreign powers, but is rather to be regarded as the first victim on a long and sanguinary list. Nephew of the Empress Dowager, he was adopted by her at the age of three.

With a view to preparing him for his great destiny, he was provided with numerous instructors, two of whom were my own students. Their duty was to induct His Majesty into a knowledge of the English language, and, in order to be sure that the lessons which they set for him were correct, they always submitted them to me for approval. I shall not affirm, therefore, that I am entirely innocent of having exerted some influence to bias the mind of the young Emperor.

It is impossible that he should have studied English without becoming infected with progressive ideas. Still, the blame, or the honor, of having perverted the mind of the "illustrious successor" (as his name signifies) belongs to Kang Yu Wei more than to any one else. This patriotic scholar perceived the necessity of reforming the educational system of China in order to secure the permanent independence of his country. He gained the ear of the Emperor, and of that young man it is no little praise to say that he possessed the intellectual capacity to comprehend the ideas of the bold reformer and the strength of will to resolve on carrying them into effect.

He issued decree after decree, with startling rapidity, setting aside the effete system of essays and sonnets in civil service examinations, in favor of the sciences and practical arts of the modern world.

In order to prepare students for these new tests, a system of common schools was to be established, Taoist, Buddhist, and Confucian temples being placed at their disposal. Middle schools were to be established in all the districts, and colleges in the several provinces, with a new university in the capital for the graduates of provincial institutions and for the sons of the nobility.

Nor did His Majesty stop with educational reform. He diligently sought to prune away the dead branches of the tree in order to increase the quantity and improve the quality of its fruit. *Sinecures* in the Mandarinates were abolished, and new bureaus inaugurated, such as those for commerce, mining, and agriculture.

More than all, he resolved to confer on his people the priceless boon of free speech, ordaining that even junior officials should have the privilege of addressing the throne without let or hindrance.

This was the rock on which his noble scheme of reform was shattered. A young man, a doctor in the Han Lin, who was well known to me, through a

junior member in the Board of Rites, drew up a memorial proposing numerous changes in the administration of the government. His chiefs, all old men, and mostly Tatars, refused to transmit the document to the throne. The Emperor, on learning that they had dared to intervene between him and his officials, flew into a towering rage, stripped them of their official honors, and threatened to dismiss them from the public service.

Those old men, smarting under the disgrace, posted away to the country palace and threw themselves at the feet of the Empress Dowager, begging her to come out of her retirement and save the Empire from the hands of a young man who was driving the chariot of state so furiously that there was danger of his setting the world on fire. She had been regent twice before, but she had never retired altogether from the world of politics. With her neither card parties nor novels nor theatrical shows could compete in interest with the political chess-board; in all moves on that board her fingers had been more or less concerned. Eagerly did she embrace the invitation, and as with a bolt out of the blue heavens she struck down the impetuous youth, compelling him to sign a paper begging her to teach him how to govern. By way of justifying her action, she issued an edict, in which, among other things, she said that her subjects must not suppose that she was opposed to rational progress. It does not follow, she said, that we should stop eating because we have been choked. She meant to say that her adopted son had crammed his reforms down the throats of his people too fast for their digestion. She intended to administer them with judicious moderation, in such quantity and degree as would make them easier of assimilation.

Well had it been for her and her dynasty had she adhered to this principle; on the contrary, throwing herself into the hands of a reactionary party, instead

of progress she entered upon an anti-foreign reaction in which a disastrous smash-up became inevitable. She began by canceling all the educational and other administrative reforms inaugurated by the young Emperor.

The only one of the institutions established by him which she permitted to remain was the new university. That institution she no doubt spared because it had been favored or, as one might say, founded by Li Hung Chang, who, by the way, though he still continues to be her faithful servant, has behind him a record of imperishable glory as the foremost patron of the new education in the Chinese Empire. It was he who recommended me for the presidency of the university, which I may describe as at present in a state of suspended animation, the Russians having seized on the buildings for soldiers' barracks and threatened to confiscate its funds, which were deposited in Russian banks.

THE GROWTH OF THE ANTI-FOREIGN FEELING IN CHINA.

A little before the *coup d'état* Germany had seized a seaport by way of reprisals for the murder of two of her missionaries in the south of Shantung. Russia demanded the cession of Port Arthur as an offset. England insisted on having Wei Hai Wei, on the opposite side of the gulf, in order to keep watch on the movements of her northern rival. France, in the far south, protested against being left out in the cold, for was she not as great a power as any of them? She demanded that the equilibrium of the political balance should be maintained by giving her the Bay of Kwang chau, not far from the borders of her Anamite Empire. The Empress, who by this time had become Regent for the third time, was irritated beyond endurance, and while she feigned to yield to these demands rather than to make war without due preparation, she made it known to her people that if any

other nation should come forward with similar demands, she would declare war with or without preparation. In the meantime she made extensive purchases of war material, and sought by every means to propagate anti-foreign feeling among her people as the best safeguard against foreign aggression.

Never had the anti-foreign feeling been at so low an ebb as during the short reign of the young Emperor. An awakening had shown itself among the Chinese people, which might be described as a shaking among the dry bones. Newspapers in the Chinese language had increased in two or three years from 17 to 76. The publication of the society for the diffusion of Christian and useful knowledge, consisting not of "Christian science," but science christianized, increased within the same time from \$800 to \$18,000. The whole people were penetrated with a desire for progress, and though they had been recently beaten in war by the Japanese, they proposed to imitate their victorious enemies and learn the best lessons of the west as the surest way of rehabilitation.

When the Marquis Ito visited China, a little more than two years ago, I complimented him on the influence which his country was exerting on China in consequence of being her nearest neighbor. I compared it to the tide, raised by the moon, as our nearest neighbor in the solar system; but I took care not to hint that his country, like the moon, was shining by borrowed light. Yet it is true that the reforms which China and her young Emperor so much admired were borrowed at second hand from these United States.

Immediately on the occupation of Kiao chau the Germans proceeded to lay out railways in different directions across the province of Shantung, which they claimed as their sphere of influence, and which some of their newspapers, by way of anticipation, described as "German China." The natives were aroused,

much more by these enterprises than by any abstract question of infringement of territorial rights. To them it appeared horrible that the spirits of their ancestors should be waked by the snorting of the iron horse, and that cemeteries should be desecrated by the passage of the iron road. They everywhere set upon the engineers and impeded the prosecution of their work. The most active in leading this opposition were the members of a secret society called "Boxers."

THE REVIVAL OF THE BOXERS.

That society is not a new one called into existence, as has been supposed, by the work of missions. On the contrary, it gave trouble more than a century ago to the Chinese Government, and in 1803 was formally placed upon the index of forbidden associations. Since then it has languished in obscurity until recent events called it into life, and until the favor shown it by the Empress Dowager transformed it into a great political party. The doctrine to which it owes its existence is not orthodox Confucianism, Buddhism, or Taoism, but a superstition based on hypnotism, mesmerism, or spiritualism, as it is variously called. Among its members are many whose nervous condition fits them for spiritualistic mediums, and through these the society gets oracles from the unseen world. They undergo a species of drill, which is intended to enable each member at will to go into the trance state. When in that condition they profess to be endowed with supernatural strength and rendered bullet-proof. These mysteries, so piquant to the curious at all times, were particularly attractive in view of possible hostilities with foreign nations. The organization spread like wildfire among the people of Shantung, and the Manchu governor, finding in these people an auxiliary force, supplied them with arms.

The Empress Dowager and Prince

Tuan encouraged them to come to the capital. In their devastating march they killed missionaries and laid waste Christian villages; nor did they abstain from many a village which was not Christian, but which excited their cupidity by the spoils which it offered. Reaching the vicinity of the capital, they tore up the railway leading to the west and burned down the stations near the city. Then it was, not till then, that the ministers in the capital awoke to the seriousness of the situation. Missionaries had been uttering their Cassandra warnings, but the ministers always turned for information to the Tsung Li Yamen, the official organ or Foreign Office of the Chinese Government. They were there told that these Boxers practiced an innocent kind of gymnastics, and if they did sometimes show themselves turbulent and disposed to quarrel with native Christians, it was not without cause; but the Empress Dowager intended shortly to issue a decree dismissing them to their homes. Such decrees were issued, accompanied by secret instructions not to regard them.

THE SIEGE.

The meaning of the destruction of the railway was not to be misunderstood; the ministers, without waiting for the consent of the Chinese Government, ordered a guard of marines to be sent up from the seacoast, and they arrived not a day too soon. The next day the railway to the east was also broken up, and had their arrival been delayed forty-eight hours no foreigner in Peking would have lived to tell the tale. They were only 350 in number, but their mere presence for a time held our enemies in check, and they served eventually to make good the defense of the legations.

On June 11, a fortnight after their arrival, an attaché of the Japanese Legation was killed at the railway station by Boxers and Chinese soldiers combined. This may be regarded as introducing the

first stage of the siege; for the next nine days the Boxers were specially prominent, setting fire not only to churches and mission houses, but burning up all the native storehouses which they suspected of containing foreign goods. Square miles of ground were left by them covered with the ruins of the richest business houses in Peking. On June 19 a circular from the Foreign Office informed the foreign ministers that the admirals had demanded the surrender of the forts at the mouth of the river. This, said they, is an act of war. You must now quit the capital with all your people within four and twenty hours. The ministers agreed to protest against the severity of this condition. The first to set out for the Foreign Office with this purpose in view was Baron von Ketteler, the German Minister. No sooner had he reached the great street than he was shot in the back by a man wearing the official costume of the Chinese Government, and fell dead. His interpreter was wounded, but succeeded in making his escape and giving the alarm.

The other ministers believed that a general massacre had begun, and with their people, who had already taken refuge under their several flags, they fled precipitately to the British legation, which, having been the residence of a high prince, covered a large space of ground and was surrounded by strong walls, forming a citadel capable of defense. It had accordingly been agreed upon as a place to make a stand in the last resort, and Sir Claude MacDonald not only generously welcomed his colleagues, but received all their people, whether civilian or missionary. The missionaries were accompanied by their converts, Catholic and Protestant, to the number of nearly two thousand. For the converts an asylum was secured in the grounds of a Mongol prince on the opposite side of a canal from the British legation. Professor James, the man chiefly instrumental in securing it, was

himself slain by the enemy in the afternoon of the same day. Had the enemy followed up their advantage they might, perhaps, in the midst of our first confusion, have overwhelmed all the legations; but they feared to come to close quarters.

Some of the outlying legations were destroyed by fire, but most of them were included within our line of defense. None of them, however, except the legation of Great Britain, was considered safe for the residence of a diplomatic family.

Within the gates of the British legation, which covered six or seven acres of ground and contained twenty or thirty different buildings, were congregated nearly one thousand foreigners, and from this time for eight weeks we were closely besieged, not by Boxers, but by the soldiers of the Chinese government. That very evening, at nightfall, they opened with a terrible fusillade, and this was renewed day after day, chiefly under cover of night; so that we came to speak of it rather contemptuously as a "serenade." It was not, however, altogether ineffective, for day by day some of our men were killed or wounded, and in the sorties, which were occasionally made to drive our assailants back or to silence their batteries, the casualties were always serious.

What we most dreaded was the fire-brand, and when the ruthless enemy, with more than vandal ferocity, set fire to the library of the Imperial Academy, for the purpose of burning us out, we all had to assist in fighting the flames. Women and children, including the wives of ministers, passed buckets from hand to hand. A change of wind came to our aid, and the legation was saved. At first the enemy assailed us only with fire and small arms; gradually, however, they got guns of considerable calibre in position, and at all hours of the day attacked us with shell and round shot.

Mrs. Conger, wife of the minister, in whose family I was kindly received as a guest, had embraced the ideal philosophy of Bishop Berkeley, and looked on all this pyrotechny as a play of the imagination. I envied her the comforting delusion, for when I went out and picked up a six-pound round shot, I found it too heavy and solid to be resolved into a fancy. Whether owing to her philosophy or to her Christian faith, she is one of the most admirable women I ever knew; calm and unperturbed in the midst of danger, she realized the description which Pope gave 200 years ago of his ideal woman, as "Mistress of herself though China fall."

Mr. Conger, an old soldier, who fought through all the years of our civil war and marched with Sherman from Atlanta to the sea, met the trials and exigencies of this occasion with becoming fortitude and cool judgment. Diplomatist as well as soldier, he knows how to deal with the most serious questions that confront him as negotiator in this Chinese problem. His daughter, Miss Conger, had visited many water cures in quest of health. The fire cure to which she was now exposed proved to be the required remedy. On the first fire she threw herself weeping into her father's arms; the next day she listened to it calmly, and then from day to day she seemed to acquire new strength, until she came out of the siege restored to perfect health.

If I be asked how we spent our time, I answer, there was no frivolity and no idleness. Every man had his post of duty. Mine was to serve as inspector of passes at the legation gate for Chinese going back and forth between the legations within our lines. There it was my sad lot to see many fine young men go out full of life and hope, to come in wounded, maimed, and dying. We lost in all, killed and wounded, more than a third of our number.

If we are asked what we lived on, I answer, the coarsest of bread and the

poorest of meat. The meat was that of horses, varied by an occasional mule; even that was so reduced in quantity that only three ounces per diem was allowed for each individual. Milk was a luxury; even condensed milk beyond our reach, and no fewer than six or seven infant children perished for want of it.

While the men fought or mounted guard the women made sand bags from day to day to the number of many thousands for the strengthening of our fortifications, and by their calm demeanor and hopeful words they strengthened the arms of their brave defenders.

On one occasion it was deemed necessary to make a desperate effort to regain possession of a portion of the city wall which dominated these legations. A company of some 60 men—American, British, and Russian—was formed under the lead of Captain Myers, of the U. S. Marines. When ready to make the attack, and hoping to take the enemy by surprise, he made a short speech.

"My men," said he, "within yonder legation there are 300 women and children whose lives depend upon our success. If we fail, they perish and we perish with them; so when I say 'GO,' then go."

The Americans and English were thrilled by his words, and the Russians understood his gestures. All felt that it was a forlorn hope, and all were ready to lay down their lives to insure success.

The movement proved successful, and that portion of the wall remained in the possession of our men until our rescuers entered by the water-gate beneath it.

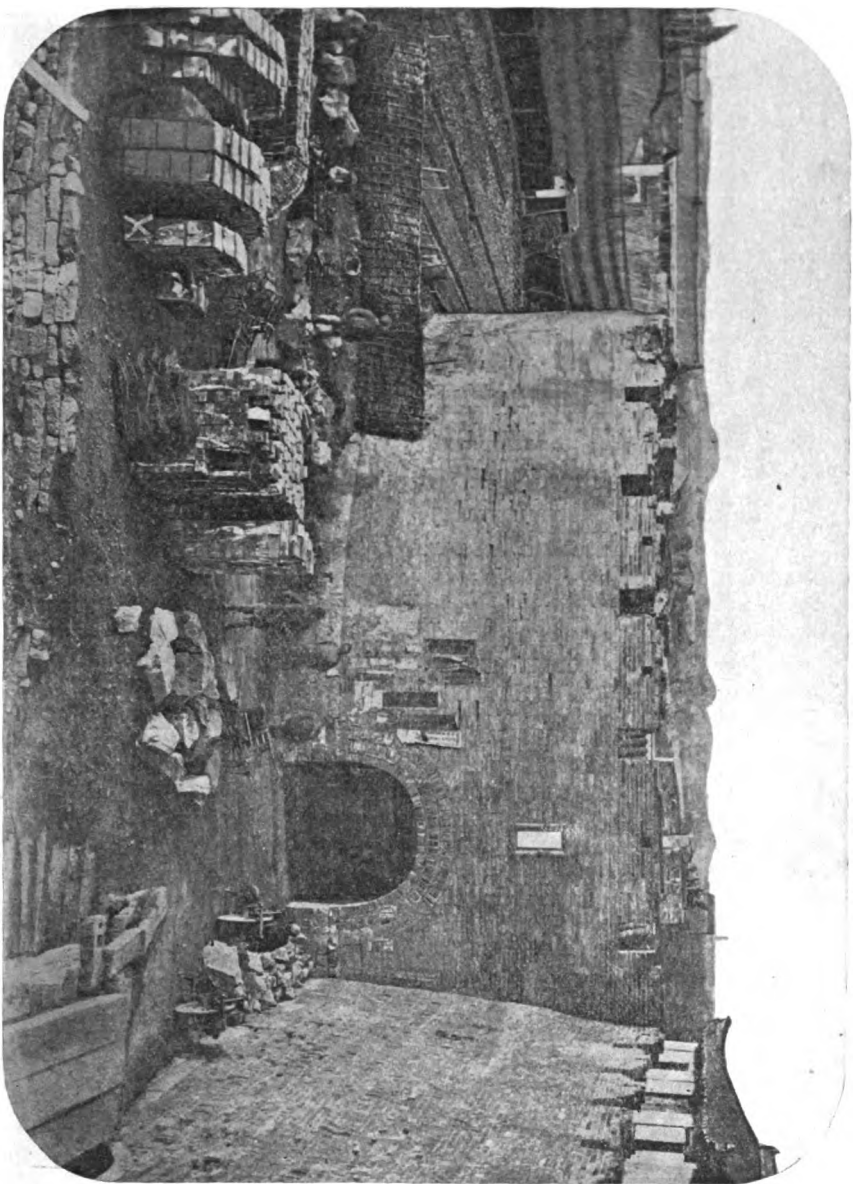
THE RELIEF.

When the siege began we expected relief in a few days; but when Seymour's column was driven back we tried to wait with patience for the coming of the grand army under the eight banners. Yet so closely were we shut up that we had almost no information as to its move-

ments, and our souls were sickened by hope deferred. At length, when our rations had run almost to the lowest ebb, when we had horse meat for only two days more and bread for no more than a fortnight, so that starvation actually stared us in the face, one night, on August 14, a sentry rushed into Mr. Conger's room, where I also was trying to sleep, and cried out, "They are coming; they are coming; the army of relief! I hear their guns!" The minister and I were soon in the open air; we did not wait to put on our clothes, for we had never taken them off. We heard the machine guns playing on the outer wall, and never did music sound so sweet. It was like the bagpipes of Havelock's Highlanders to the ears of the besieged at Lucknow. The ladies were wakened, and soon men and women poured out from all the buildings and listened with irrepressible excitement to the music of the guns. Women threw themselves on each other's necks and wept, while men grasped hands with feelings too deep for utterance.

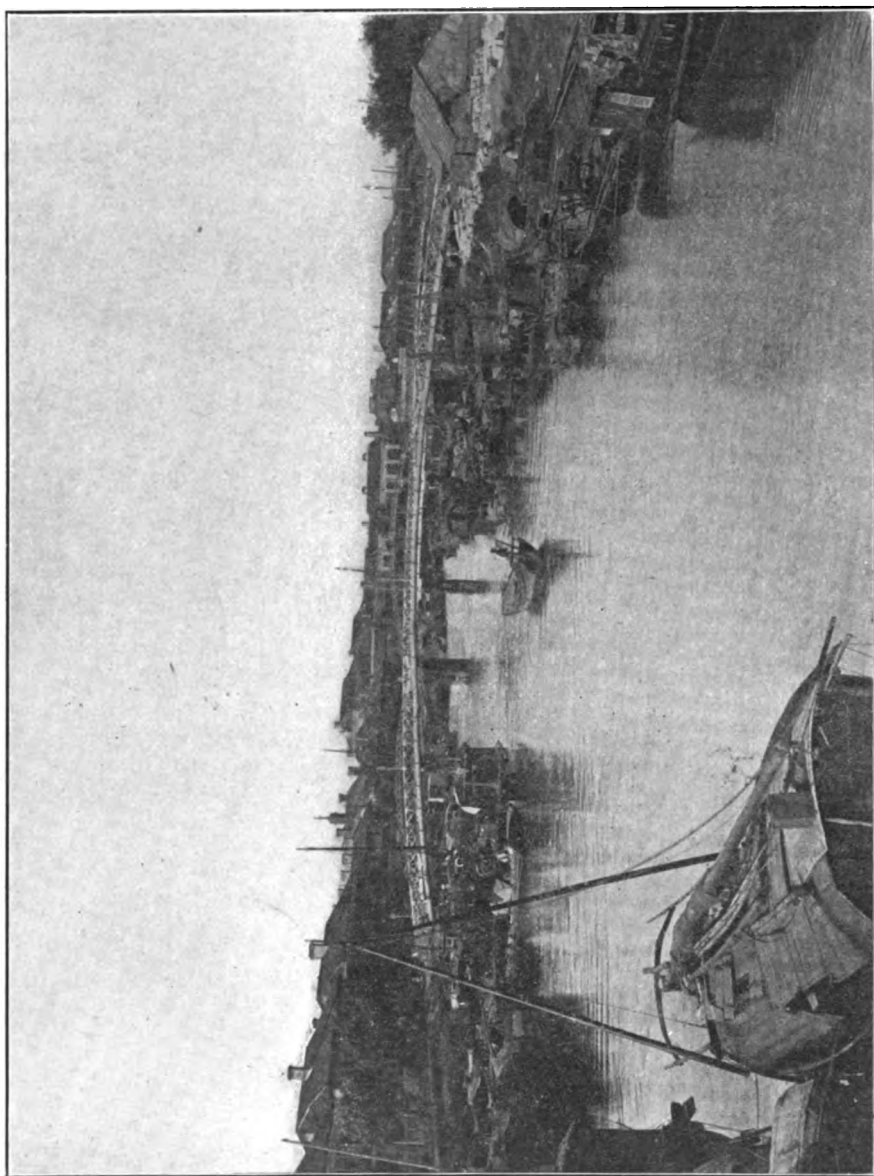
The next morning the great gates of the legation were thrown open, and in rode a company of Indian cavalry. They were, I thought, and I have no doubt every one of our besieged garrison thought the same, the finest men I had ever looked upon.

The siege was ended. The rest of the army entered by the great front gate of the city, the key of which had been captured from the flying enemy by Captain Squires, of our legation, who is one of the heroes of the siege. The next day we all joined in singing a *Te Deum* in the tennis court of the legation, and Dr. Smith in a short address pointed out ten circumstances in each of which the finger of God was visible in our deliverance. He might have extended them a hundred. After thanking God, it only remains to thank our noble President for having dispatched the army and navy to our succor without waiting



Old Gate in City of Peking.

From Commander Harrie Webster's collection of Chinese pictures.



Suchau Creek at Shanghai.

From Commander Harrie Webster's collection of Chinese pictures.

to call an extra session of Congress. I feel proud of my country for the record she has established on this occasion, not only taking her place among the Great Powers who have interests as wide as the world, but showing that her arms are long enough to protect and rescue her people in all parts of the globe.

INDEMNITY FOR NATIVE CHRISTIANS.

The curtain has not yet fallen on the last scene of this tremendous drama. The Empress and her court fled the city almost at the moment when our troops entered it, and she has taken refuge at an old capital in one of the northwestern provinces. Whether the government will be reestablished at Peking is highly problematical. For my own part, I think the restoration of the young Emperor, who might carry out his progressive measures under the supervision of the Great Powers, offers the best solution. The integrity of the empire would then be maintained and possible conflicts between European claimants averted.

China must, of course, pay a heavy war indemnity. It is understood that not only the foreign nations, but individual foreigners, will be indemnified; but no assurance is given that any compensation

will be made to native Christians, whose houses have been burned and whose relations have been slaughtered. Diplomats and military men have joined in acknowledging that but for the bone and muscle supplied by those native Christians, the defense of the legations would have been impossible. Though they performed the humble office of navvies in building barricades, digging trenches, and countermining against the enemy, their services were indispensable to the common safety.

I cannot believe that any Christian country will consent to the gross injustice which is involved in excluding them from the provisions of the indemnity clause.

The greatest enemy to the orderly and profitable intercourse of nations is heathen darkness. No restriction, therefore, should in any way be placed on the operations of missionary bodies who seek to dispel that darkness, and to diffuse the light of science as well as religion. Without these our railway and mining enterprises will be insecure, and we can have no assurance that that monster, the dragon, who has now been cast down before the Soldiers of the Cross, will not again raise his head and bring about another catastrophe similar to that which has so lately horrified the world.

SINGAN—THE PRESENT CAPITAL OF THE CHINESE EMPIRE

SINGAN owes to its position the distinction of being for at least the fifth time the capital of the Chinese Empire. The mountain valley in which it is situated is marked out by nature to be the center of the national life. Through it flows the Weiho, along whose banks lies the great road which leads

from northern China into Central Asia. Near the city the river is joined by a northern tributary, the Kingho, and then, running east, it breaks through the mountains by the "gate of Tung-kuan," where there is a famous fortress of the same name. This gives an easy access to the eastern and coast provinces. In

this valley also are the only practicable passes, two in number, over the T'sin-ling Mountains, which form the barrier between northern and central China.

In consequence of these unrivaled advantages, trade routes from every direction have converged here from time immemorial and made it a place of great commercial importance, famed for the enterprise and wealth of its merchants. It is the trade center from whence the silk of Chekiang, the tea of Honan and Hupeh, and the silk and sugar of Szechuan are distributed to the markets of Mongolia, Turkestan, and Russia in exchange for rhubarb, musk, medicinal plants, opium, wool, and furs.

The valley of the Weiho is one of the granaries of China, and the city itself is in the midst of a vast wheat field. The traveler approaching from the east passes through a country "like one continued splendid park, with knolls and lawns and winding paths." The road is a "fine highway—for China, with a ditch on either side, rows of willow trees here and there, and substantial stone bridges and culverts over the little streams which cross it." The city is surrounded by a high wall, said to be forty miles in circumference, with four huge gates flanked by magnificent towers. The principal streets are well paved, and full of good shops, together with palaces, imposing temples, and government buildings.

One of the few European travelers who have visited Singan, the Rev. A. Williamson, says that it appeared to be "densely filled with houses, having little or no vacant ground or gardens as in other cities." At that time, 1866, it was the residence of a Roman Catholic bishop, who claimed that there were about 20,000 Christians in his diocese. Its population is variously estimated from five hundred thousand to a million souls. Michaelis, who visited it in 1879, writes of the courteous treatment which he received wherever he went from the crowds which thronged the streets.

Though Singan contains no buildings of great antiquity—a mosque built in the ninth century is probably the oldest structure—the famous Pei-lin, or "Forest of Tablets," is the most valuable archæological and historical museum or library in China. Here are tablets which chronicle events of five dynasties from B. C. 100. Others are apparently mere specimens of elegant calligraphy and drawings of well-known mountains and historical scenes. There are also emblematical animals, sacred birds, and likenesses of their great men. Among these is a full-sized portrait of Confucius and several of his disciples. The most celebrated of all are the Thirteen Classics, cut in stone, dating from the Han dynasty, far anterior to those in Peking, now so famous. The most interesting monument of past times to the Occidental visitor, however, is the Nestorian tablet, commemorating the introduction of Christianity into China. On it is an inscription in Syriac and Chinese characters giving first a vague abstract of Christian doctrine, and then follows this passage:

"In the time of the accomplished Emperor Taitsung, the illustrious and magnificent founder of the dynasty, among the enlightened and holy men who arrived was the most virtuous Olopun, from the country of Syria. Observing the azure clouds, he bore the true sacred books; beholding the direction of the winds, he braved difficulties and dangers. In the year A. D. 635 he arrived at Chang-an; the Emperor sent his Prime Minister, Duke Fang Hiuen-ling, who, carrying the official staff to the west border, conducted his guest into the interior. The sacred books were translated in the imperial library, the sovereign investigated the subject in his private apartments; when, becoming deeply impressed with the rectitude and truth of the religion, he gave special orders for its dissemination."

The imperial proclamation, which is

given, commends the principles of this new religion and closes with these commands: "Let it be published throughout the Empire, and let the proper authority build a Syrian church in the capital in the I-ning Way, which shall be governed by twenty-one priests." Then comes a summary of prominent events connected with the "Illustrious Religion" and a recapitulation of them in an ode in octosyllabic verse. At the end is the date of its erection, A. D. 781, "in the second year of Kiengchung, of the Tang dynasty, on the 7th day of the 1st month, being Sunday," and the names, possibly of donors, of sixty-seven priests in Syriac characters and sixty-one in Chinese.

The tablet, which is said to be the oldest Christian inscription yet found in Asia, was discovered in 1625 and is now in a brick inclosure outside the city walls amid heaps of stones, bricks, and rubbish. Its preservation is due, strangely, to the care of a Chinese, as an inscription on the edge of the stone shows. It is to the effect that, in 1859, a man named Han-tai-wha, from Wu-lin, had come to visit it, and had found the characters and ornamentation perfect, and that he had rebuilt the brick covering in which it stood. The last words are: "Alas! that my friend Woo-tze-mi was not with me, that he also might have seen it. On this account I am very sorry."

The tablet is, or was—for it may have been destroyed in the fanatical hatred of all that is foreign which has taken possession of the people—a striking witness of the power which the Christian faith had over the Chinese a thousand years ago and in the nineteenth century, for this restorer and his friend must have been native Christians.

It is remarkable that Singan is identified with the greatest men whom China has produced and with the most glorious epochs of Chinese history. This is especially true of the time, B. C. 1122, when it was first made the capital of

the Middle Kingdom by Wu-wang, the founder of the Chau dynasty.

"No period of ancient Chinese history," says Dr. Wells Williams, "is more celebrated among the people than that of the founding of this dynasty, because of the high character of its leading men, who were regarded by Copernicus as the impersonation of everything wise and noble." The Emperor, with his father and brother, ranked "among the most distinguished men of antiquity for their erudition, integrity, patriotism, and inventions." It was then known, and for many centuries afterwards, as Changan, or "Perpetual Peace"—a name still preserved as that of one of the quarters of the modern city. In B. C. 246 one of the greatest rulers China ever had chose it for his residence. This was Chi Hwangti, the "first universal emperor." Though a boy of but thirteen years of age when he ascended the throne, he speedily showed great capacity for governing and as a warrior. To improve the communication between his capital and the provinces he constructed magnificent roads and bridges, some of which remain to the present day. This work was carried on by his successor, who is said to have spanned the valleys of the neighboring mountains with suspension or "flying" bridges, thus anticipating western science by twenty centuries.

But the "universal emperor's" fame as conqueror of the Tatars and the builder of these public works and the Great Wall is eclipsed by his unwise efforts to secure certain reforms. He had become convinced that the fanatical worship of the past which characterized the teaching of the scholars was fatal to progress and full of danger to the state. He determined therefore to break once and for all with the past, and ordered that all books having reference to the past history of the Empire should be burned. This decree, which was almost universally obeyed, and with considerable loss of life, apparently but strength-

ened the evil against which he was striving. It is a significant commentary on his act that in the Chinese schools of today history later than the accession of the present dynasty, 1643, is not taught. The literati, it may be added, disregarding the true reason of his decree, attribute it simply to his vanity—the hope “that he might by this means be regarded by posterity as the first emperor of the Chinese race.”

Nearly nine hundred years later Singan is again made the capital by Tait-sung, who so cordially welcomed the Nestorian priest. He was “famed alike for his wisdom and nobleness, his conquests and good government, his temperance, cultivated tastes, and patronage of literary men. He established schools, and instituted the system of examinations, and ordered a complete and accurate edition of all the classics to be published under the supervision of the most learned men in the Empire.” It is probably not too much to say that during his reign this now almost unknown city was the center of the most advanced civilization that existed at

that time on the earth. Soon after his death the throne was usurped for twenty-one years by a woman, who bears a remarkable resemblance in some respects to the Dowager Empress who now exercises supreme power in this ancient city.

In our own times Singan is noted for the brave and successful defense of its inhabitants against the Mohammedan rebels in 1865, although there were some 50,000 of their coreligionists within the walls. These were compelled to abjure their faith on pain of death, and to put up in their mosques inscriptions to the emperor and to Confucius.

The situation of the city, over six hundred miles from the coast, and its impregnability to any force that it is likely could be brought against it will probably make it seem for the interest of the present rulers of China that it should be once more the permanent capital of the Empire. From its history in the past we may hope that this will be the presage of an era brighter for the Chinese than that which is apparently closing.

JAMES MASCARENE HUBBARD.

THE MIDNIGHT SUN IN THE KLONDIKE

AFTER the long, dark, dreary days of winter, summer approaches with marvelous rapidity. Before the snow has all disappeared the days are twenty-four hours long, and there is no need for candles or lamps during the months of June and July and part of May.

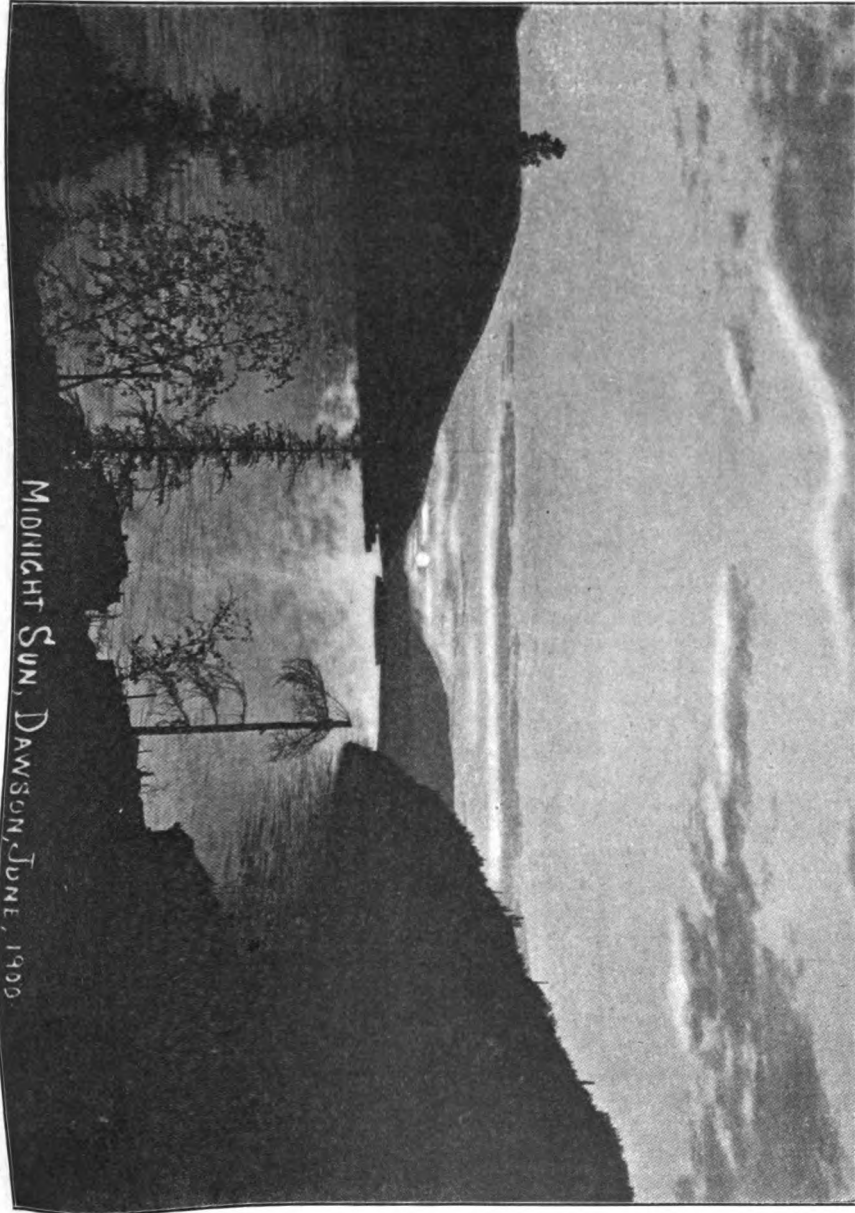
About the middle of June photographs can be taken quite distinctly at midnight. Many, fond of climbing, like to mount the highest domes and watch the sun at midnight. If the night is clear, they are well repaid for their climb. There is a strange, weird look about the sun at such a time—a sort of tired look, as if he would like to disappear below the horizon for a little rest, and then mount

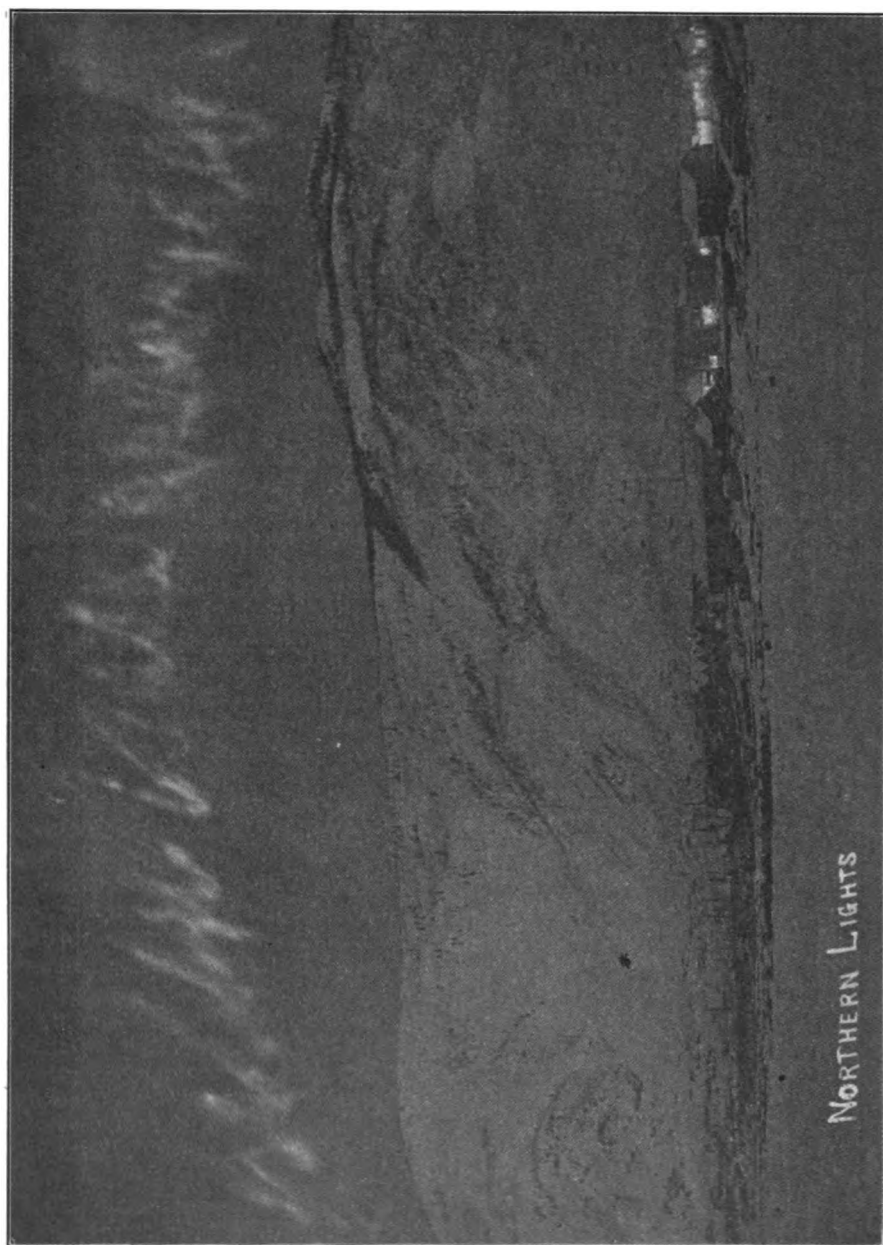
in the morning like a giant refreshed.

He marches steadily on, and just as we think he will descend below the skyline, he gradually turns eastward and heavenward and soon begins to flood the lesser hills with light and warmth. We then turn homeward, for if caught too far from home when the sun has regained height and power, we shall feel in no mood for walking, as the summer days in the Klondike are fiercely hot and wearying.

What a contrast there is between the dark, sunless, icy days of winter and the bright, glaring, almost unbearably hot days of summer!

ALICE ROLLINS CRANE.





NORTHERN LIGHTS

THE NORTHERN LIGHTS

AFTER an intensely dry, cold day I have watched for a display of the Northern Lights and have been rewarded by seeing one of the most beautiful displays nature can afford.

At its first appearance the Aurora is hardly noticeable, but in a few minutes the bright, luminous cloudlet enlarges and rapidly rushes from east to west and from west to east, across the northern sky.

Sometimes the phenomenon will dip down almost to the earth and envelop in its bright folds tree tops but a short distance away. Then it puts one in mind of a rainbow reaching the earth and allowing one to look through its iridescent bars to the hazy landscape beyond.

It shines steadily for a while, then suddenly, as though a gentle breeze were toying with its beauty, the lambent flame begins to quiver, then becomes strongly agitated, and at last rushes along from side to side, like the opening and shutting of a silvery fan or the wings of a

swan when he is pluming himself on the bank of a stream.

I have never noticed the rainbow-like colors depicted in some paintings. The light was more like steam rising at night, brilliantly illuminated by a beam of electric light.

Then at times it would gradually fade till it resembled phosphorescent waves barring the progress of a ship.

At such times visitors coming into our cabin from the dry, crisp air would pull off their skin mitts amid a cackling of electric sparks; our blankets and fur coats, if rubbed, would give out a succession of sparks, and our hair would try to stand away from the head like quills on a porcupine, and if brushed would snap and sparkle very distinctly, all the time clinging to the brush or to anything placed above the head. I have walked to the stove and with my knuckle drawn a spark from the metal top half an inch long.

ALICE ROLLINS CRANE.

JAPAN AND CHINA—SOME COMPARISONS

BY COMMANDER HARRIE WEBSTER, U. S. N.

IN many respects the people of China and Japan are not comparable, because their ethical, racial, and ethnological differences are so marked as to make comparison misleading.

But the wider and more continued the field of observation, the smaller become the differences remarked. The observant traveler will assert that the Chinaman's eyes are as horizontal in their major axis as are ours. The assertion is quite correct! The slanting effect is caused by the configuration of the eye-

brow, and to some extent by the tendency of the Chinaman to keep the eyes partly closed, due to the absence of a projecting visor or peak in their head coverings. As a matter of fact, the eye sockets in the Chinese skull are shaped and arranged practically as are those in the Caucasian. Examples in support of the position here assumed might be multiplied, but this, the most striking, seems sufficient to substantiate the contention.

The Japanese hold the position of

being the most progressive people of which history gives any account, and the most singular fact in connection with this progress is that its genesis was spontaneous, no outside influence or pressure being brought to bear to effect the tremendous changes in the governmental system and methods.

The change was a true evolution, and was carried out with practical unanimity by governors and governed alike.

A point seldom or never noted by travelers or writers on ethnological subjects is the odor possessed by the various tribes of men, and for want of a better phrase I will call it the "race smell."

The race smells of several members of the human family are distinct enough to influence not only their neighbors, but the domesticated animals of other races. Witness the race smell of the North American Indian, sufficiently marked to be disagreeable to white nostrils, and to be a source of alarm to our horses and dogs.

From observation I am led to conclude that the accidents of clothing, habits, and environments are operative upon the race smell only as modifiers, increasing or decreasing that smell according to circumstances. Witness the strong race smell of the Negro, persisting in spite of the environments of ages of civilization.

The application of the foregoing to the question under discussion lies in the fact that the race smell of the Japanese is so slight as to be scarcely recognizable, while the Chinaman has the race smell so well developed as to be distinctly noticeable in any considerable assemblage. Its marked feature is that it produces a distinct tingling in the end of the nose of the European, and once experienced will never afterward be mistaken. The Chinaman says we smell like sheep, and our race smell is as disagreeable to him as his is to us, another and novel application of the old adage of "*de gustibus non est disputandum*."

In Japan one looks in vain for exam-

ples of bygone architectural ability, for the remains of bridges or monuments, roads or temples, and the idea impresses itself upon the mind of the observer that Japan is a new country, that its past is but of yesterday in comparison with China, Korea, or India; but this impression is speedily forgotten when an examination of the literature, laws, language, and art discloses the fact that Japan counts her history by thousands of years, and that her literature contains examples written before the day of the Roman Empire. We are shown pieces of bronze-work two thousand years old. We look upon an emperor who is the one hundred and twenty-first of an unbroken dynasty which was founded 660 B. C. !

We are impressed with the national virility which can, after so many centuries of existence, voluntarily modify its system of government into sympathy with the ideas of today, and follow up that tremendous change by adopting the best the modern world has to offer in every branch of human thought, and adapting itself as a people to the use of all those ideas which form the difference between the universe of yesterday and the world of today. Whether their attempts are successful is not pertinent to the subject, for, looking at the intent of the Japanese nation as exploited by her leading men, we see that, modified, it is true, by the environments of their traditions and history, Japan is well in the forefront of the family of modern nations.

In China, on the other hand, but little of interest presents itself which is not a monument of a long-departed glory. Splendid bridges, huge gateways fashioned in stone, canals, bronzes, remain unequaled elsewhere for beauty and fitness of design, a literature stretching back beyond the limits of any written history outside of this huge empire. China is of the past; her dreams are all reminiscent; her efforts are expended in

preserving what has been created rather than in producing aught of credit for the present.

It must be conceded that the signs of past ability in nearly every direction of human thought and labor compare favorably with the remains of any nation; and with that China is satisfied. Progress and the adaptation of the mental powers to the requirements of modern needs find no favor with the average Chinaman; and perhaps it is in some sense fortunate for our *amour propre* that it is so, for if the tremendous mental acumen and brain subtlety possessed by this singular and very gifted race were earnestly applied to the problems of modern life it is extremely doubtful if the intellectual superiority of the Caucasian would be so much in evidence as appears at present.

In real mental power, in the ability to grasp the most abstruse conceptions, I doubt if there can be found the equal of the better class of Chinese scholar.

The native of Japan and his yellow brother of China have, however, a marked characteristic in common, and so pervading is this trait and so important as an indication of remote common origin that I think sufficient stress has not been laid upon it by ethnologists and observers. I refer to the persistence and infinite patience shown in carrying out the greatest works without the aid of machinery—"infinite repetition of individual effort" in all branches of labor. In the minds of the people of these two nations time is not an element entering into calculation, and the cost of a piece of work is apparently computed with sole reference to the quantity of labor expended without taking into account the time as such.

The native of Japan is willing to admit that he is not the aboriginal—that is, that he displaced a preceding race—and in doing so either absorbed or destroyed that race.

Not so the proud and haughty subject

of the Son of Heaven. He aspires to be first in everything, and in consequence has convinced himself that his race is the only one ever inhabiting the land where reigns the Celestial Empire. The Chinaman contends that he is aboriginal, actually to the manor born, and that China belongs to the Chinese because no other race ever occupied the soil.

It must be admitted that the argument is on the side of the Chinaman, for no history or literature contains the slightest mention of his predecessors. The written records of Japan and China are daily becoming more accessible to the western scholar, and, notwithstanding the disbelief in their accuracy and value, these ancient documents will probably give as much real history as other ancient records of nations better known to the scholastic world.

In the matter of domestic architecture Japan and China are at the antipodes. Throughout the Mikado's Empire the people inhabit structures of wooden framework surrounded by paper walls, so that a fierce wind will often blow the sides of a house in on one side and out on the other. The roofs of these slightly built houses are, however, of strong and heavy timbers, bearing a covering of earthen tiles or thick thatching. The frequent and widespread conflagrations in Japanese cities are not regarded as inflictions to be regretted; on the contrary, the huge fires which sometimes consume hundreds of dwellings are looked upon as blessings, their cleansing and sanitary effects more than offsetting the material losses.

The almost painful cleanliness in a Japanese house is a never-ending subject of comment by foreigners, and the heartiness with which the maids of all work rub and scrub and deluge with water every available bit of wood-work is a real revelation of the innate cleanliness of the "little brown man" and all his belongings. The result of all this persistent cleaning is that throughout the

Empire not an evil smell nor a filthy spot can be found. The vile odors caused by the collection and transportation of human excreta for fertilizer are forcible proof, though not apparent at first, of the instinctive spirit of cleanliness throughout Japan.

With the Chinaman all this is almost exactly reversed. A Chinese house is built in the most substantial manner—of stone or tiles. It is, in fact, according to a trite proverb, intended to last forever, and its condition, while neat, is not especially clean. The condition of the streets in a Chinese city literally staggers belief. The villainous smells rising from the nameless filth of a street in a populous city cannot be adequately described.

Although in domestic architecture these two peoples are so diametrically different, their ecclesiastical constructions are strikingly alike. A Buddhist temple of Japan might be set up in China and little difference would be noted in the building itself, but in its ornamentation, exterior and interior, especially in the images and figures, a marked dissimilarity is observable. In the Chinese temple there is a certain grotesqueness and unreality which is lacking in the Japanese figures. Not only is this true of the modeling and action, but in coloring the difference between the artistic sense of the two nations is very striking. The acute observer can readily assign to a colored figure its correct origin by these characteristics of the two nations whose ecclesiastical art has a common genesis. It is proper to note, however, that in neither example do these artists of the Far East approach in any degree the western standards.

The charitable organizations among the dwellers in the Celestial Empire are the wonder of the western observer. The altruism born of countless centuries of civilization finds expression in charity as comprehensive in its methods as it is universal in its expression. In China

there is scarcely a type of misery, of poverty, of sickness, of distress, without its corresponding charity among the more fortunate classes. In fact, charitable organizations are not confined to the rich, but among the poor themselves societies flourish and guilds exist for the amelioration of the condition of those occupying the social strata down to the very bottom in the scale of misery.

The indigent, the sick, the maimed, the friendless, the blind, the beggar, the laborer, the young, the old, the living, and the dead—all in need of food, clothing, medicines, shelter, assistance, burial—are the objects of definite charitable societies, whose members, while constantly on the lookout for their less fortunate neighbors, seldom or never apply for assistance in their good work from the few non-members of some guild or society. Not only are the distressed and sick assisted, but the coolie, the laborer on the bund, the bearer of burdens, is the object of care and charity, and close beside the streets, crowded with porters, "pole coolies," and wheelbarrow carriers, huge earthenware jars of tea are set out, furnished with cups, for the use of those who have no season of rest save on the completion of the task in hand. And it is a pleasant sight to see the smile with which a well-dressed Chinaman will hand a cup of tea to his ragged, sweating brother, burdened almost to exhaustion and parched with thirst. In these charities, as in all other things, the Chinaman is practical, and fine-spun theories give way to the actualities of every-day life.

In practical philanthropy the Japanese and the Chinaman are widely separated, for notwithstanding the fact that charitable organizations exist and flourish among the subjects of the Mikado, they are neither so numerous nor so far-reaching as with the subjects of the Son of Heaven. The Japanese altruism deals rather with theory than with facts; so that the whole difference may be put

in a nutshell by the phrase, "The Chinaman does much and says little; the Japanese says much and does little." In both nations, however, the poor and crippled possess special privileges never interfered with by their more fortunate neighbors. It is said that robbery from a beggar is an unknown crime in either nation.

The "Potter's Field" has no existence in China. The guilds for the burial of the dead see to it that no corpse is unprovided with a coffin and a definite burial place. During my stay in Shanghai a terrible accident on the Woosung Bar resulted in the wreck of the steamer *On Wo* and the drowning of several hundreds of coolies embarked for passage up the Yangtze. These men were of the very poorest class of laborers, and as their bodies were brought to the banks few were identified by friends or relatives for burial. Under the personal supervision, however, of a local mandarin, the member of a funeral society, every unclaimed body was placed in a decent coffin and properly buried after the Chinese style.

Among the Japanese the practice of cremation has long been in vogue, and this method of caring for the dead is adopted for the safe disposition of the remains of those dying without friends or money. In fact, on account of the ravages made by cholera at intervals, the crematorium has become an adjunct to nearly all the cemeteries in the Empire. Among both peoples, however, public mendicancy is a recognized institution, and the street beggar is sure of alms; so it must strike the thoughtful mind that our western civilization does not possess a monopoly in charity, either organized or individual, and that altruism is the property of the human family rather than of any particular branch of that family. These far eastern eleemosynary institutions will surely bear comparison with any mentioned in history.

In the eyes of the Chinaman the soldier is a man defiled by blood, and in the social scale the fighter finds a place in popular estimation with the butcher, the tanner, and the preparer of the dead for burial. It follows from this that the dependence of the Empire for its defense is now and has been for many centuries the arts of the diplomat rather than the generalship of the soldier. Notwithstanding this condition, however, the Chinese have in the course of their long national history done some good fighting on various occasions and for various reasons, and it is not putting the case too strongly to assert that in the future the Chinese will give a good account of themselves on the field of battle in defense of their country, their Emperor, and of their national existence.

Passing now to the Japanese side, we see a nation so filled with patriotism, so earnest in defense of national honor, and so proud of their country, that from the earliest times they have been a fighting people. Altruism, as applied to a common enemy, has found no place in Japanese ethics, and today, having adopted the so-called western methods of warfare afloat and ashore, Dai Nippon is competent and willing to hold its own in any attack from any direction. The fighting man—the soldier—of Japan, in public estimation, stands head and shoulders above his fellows, and the dearest wish of the father of boys is that his sons may be accepted for the service of the Mikado. In all the wars of Japan the government has suffered a true embarrassment of riches in the matter of personnel, every man of the Empire tendering his services in the field for the common good.

Passing from the general to the particular, from the nation to the individual, it is interesting to note a few of the more common or ordinary differences in the two nations. The Chinaman, in a general way, is a fat and robust man; he shows the influence of prosperity by

an increase in girth; his walk becomes stately; his expression benignant and kindly. He enjoys rich food and a good deal of it. The Chinaman of wealth and position clothes himself literally in purple and fine linen, and shows in every action an appreciation of the good things of this life.

On the other hand, the Japanese, rich or poor, lives sparingly, eats plain food, and even with this limitation is genuinely abstemious in quantity. He is content with comfort without luxury, and from end to end of the Mikado's Empire it is difficult to find a fat man or woman.

The question is often asked why the punishments inflicted in these eastern countries are so barbarous and cruel.

With the Chinese, as with us, in theory, the two points kept in view in the application of law to the criminal are: first, to make the punishment fit the crime; second, to make a deterrent example for those who, without the fear of consequences, would tend to the commission of crime. It must be acknowledged that on both these points the Chinese methods are typical, and if the criticism is made that many punishments are inflicted out of all proportion to the offense, it is wise to remember episodes in our criminal history when witches were hung, burned, and done to death in various cruel ways. We can remember when the theft of a loaf of bread in England sent the victim across seas a transport for life. Even in our own enlightened land it has frequently happened that the theft of a horse meant death to the culprit. So it may be wise not to criticise the Chinaman too harshly for trying to punish the criminal and instill terror in the evil-doer at the same time.

In all literature on China and Japan the subject of morality, and especially what may be called sexual morality, occupies a due proportion of space, and its discussion is of great interest, but a clear

understanding of the subject requires a more careful study of morality in the abstract than most writers can bestow.

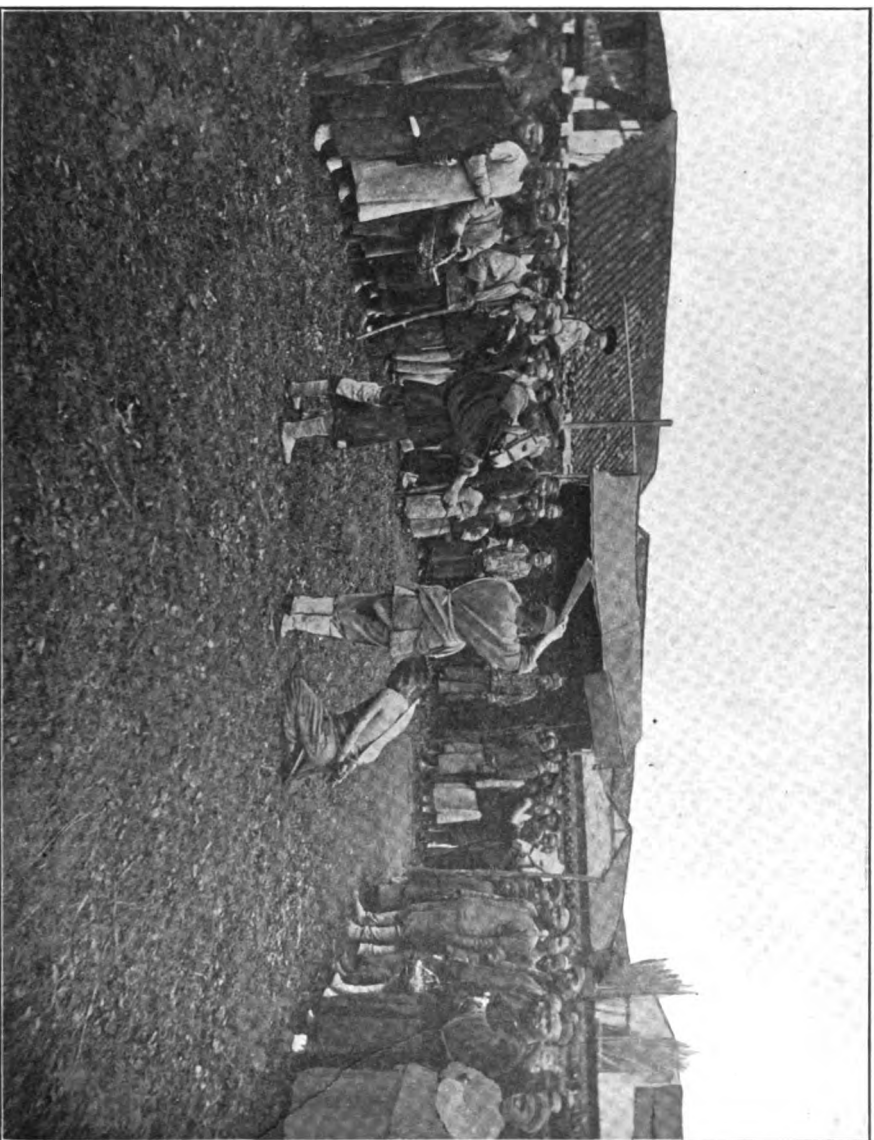
In this, as in many other important questions, much depends upon the point of view, and it is very difficult indeed to make a correct and comprehensible presentation of the point of view of the Asiatic upon such a vital subject as sexual morality. Generalization based upon incomplete knowledge is misleading and dangerous, and in connection with this question rests the real status of woman in China and Japan, a subject much too intricate to be presented in the pages of this Magazine.

Perhaps in no single direction do the Chinese differ more from their Japanese neighbors than in the official position of woman. In China a man's wife is of little moment in the public or, more properly, the outdoor life of her husband. She seldom appears on the street, she has no male visitors presented to her, and so far is this effacement carried that to inquire after a wife is regarded as near akin to an insult to the husband.

On the other hand, however, it is asserted by old residents in China that in matters of family economy, finance, politics, and the conduct of affairs the woman of the house has a wide range of influence, and in spite of the fact that female education is not recognized as existent, a wife generally manages to have her say in matters of interest connected with the family.

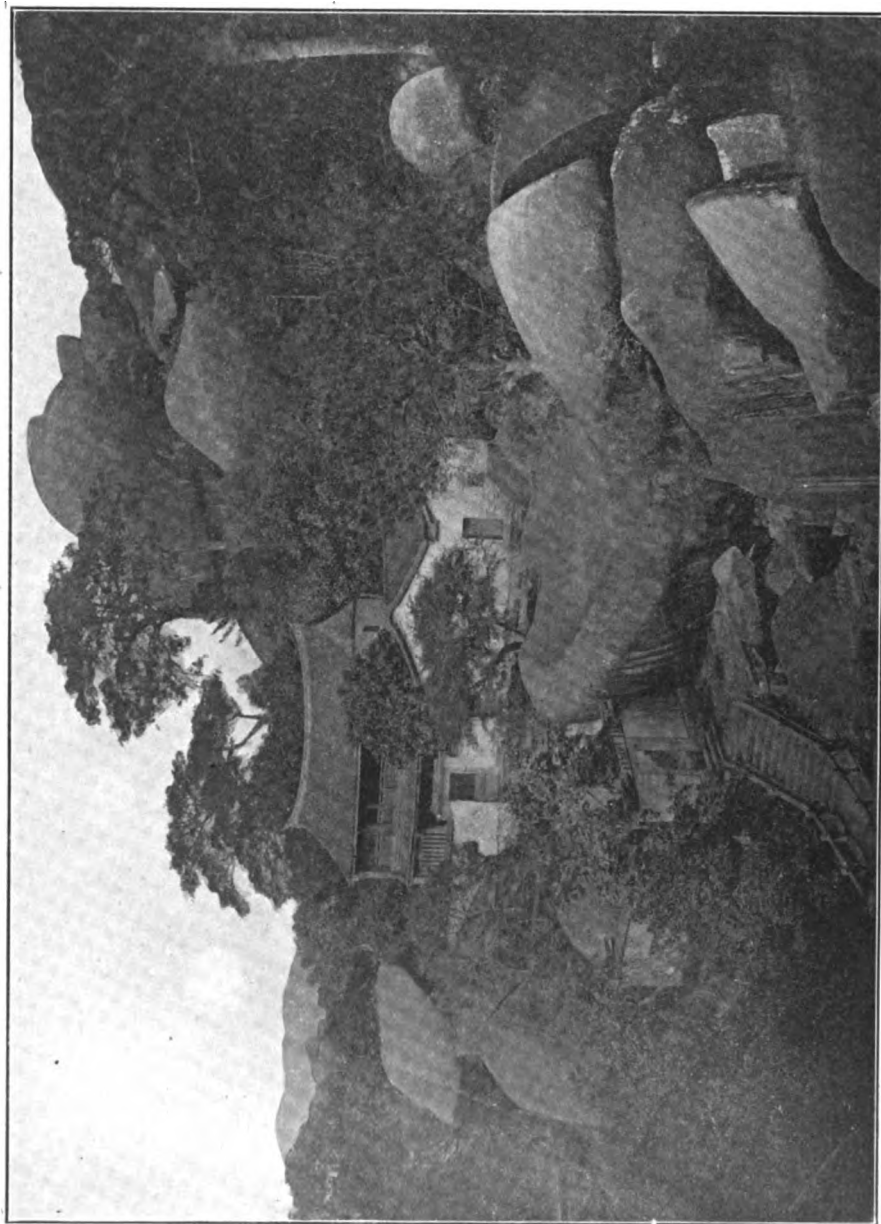
In Japan, women, girls, and children are very much in evidence, and the consideration with which women are treated, the respect shown them in public and private, and the freedom enjoyed by the women of this remarkable country are in marked contrast with the practice in all other eastern lands.

Woman in Dai Nippon enjoys, so far as can be understood by observation and inquiry, precisely the same status as her brother; has the same freedom from social restraints, has the same "right



An Execution in Pekin.—The spectators are more interested in the photographer than in the swordsman.

From Commander Harrie Webster's collection of Chinese pictures.



Rock Temple at Amoy.

From Commander Harrie Webster's collection of Chinese pictures.

of way," and works just as diligently in the field and in the workshop, and, what is more to the point, for *equal work gets equal pay!* This freedom enjoyed by women in Japan is not of recent growth. It is not the outcome of the emergence of the nation from aristocratic feudalism into the light and practices of modern politics and government, but has always existed, and is as much a matter of course as is the contrary in China.

The contrasts and comparisons made in the course of this paper are especially interesting when the histories of these two peoples are compared, for it would seem certain that the remote origins of the Japanese and the Chinese were far apart, the doctrine of modifications produced by environment being inadequate to account for the brain-fiber differences now existing between these two most interesting historical entities.

GEOGRAPHIC NOTES.

THE RUSSIAN ANNEXATION OF MANCHURIA.

BY the agreement concluded between China and Russia in December, the latter will exercise a protectorate over Manchuria in the same sense that the British maintain a protectorate of India. The 400,000 square miles of this province may thus be added to the dominions of the Russian Empire.

The conditions on which Russia consents to allow the Chinese officials to resume the civil government, which was taken from them last summer, are as follows (this agreement thus far applies only to Shengking, the southern and most important province of Manchuria, but it will be extended to include the other two provinces of Manchuria):

"(1) The Tatar General Tseng undertakes to protect the province and pacify it, and to assist in the construction of the railroad.

(2) He must treat kindly the Russians in military occupation, protecting the railway and pacifying the province, and provide them with lodging and provisions.

(3) He must disarm and disband the Chinese soldiery, delivering in their entirety to the Russian military officials all

munitions of war in the arsenals not already occupied by the Russians.

(4) All forts and defenses in Shengking not occupied by the Russians, and all powder magazines not required by the Russians, must be dismantled in the presence of Russian officials.

(5) Niuchwang and other places now occupied by the Russians shall be restored to the Chinese civil administration when the Russian Government is satisfied that the pacification of the province is complete.

(6) The Chinese shall maintain law and order by local police under the Tatar general.

(7) A Russian political Resident, with general powers of control, shall be stationed at Mukden, to whom the Tatar general must give all information respecting any important measure.

(8) Should the local police be insufficient in any emergency, the Tatar general will communicate with the Russian Resident at Mukden and invite Russia to despatch reinforcements.

(9) The Russian text shall be the standard."

The "Boxer" movement was scarcely noticeable in Manchuria, and what little there was of it was easily suppressed by the more sensible of the provincial Chi-

nese officials; but the Chinese soldiery rivaled the Boxers of Peking. Hundreds of miles of the railway were torn up in a single week by Chinese regular troops under the direction of local military commanders. This destruction has not yet been repaired.

It is stated on good authority that Russia has today in Manchuria, and along the frontier of this province, 3,900 officers and 173,000 men, with 340 guns. In addition, between 35,000 and 40,000 men will be despatched by sea to reinforce this large army, and many thousands more will proceed to the Far East over the Trans-Siberian road.

THE POWERS IN CONTROL IN CHINA.

DURING the second week of January, Russia turned over to Germany the Shanhaikwan Railway, which runs from Tientsin to Niuchwang. This road was built by British capital, but as it commands the route from Manchuria to Peking, Russia seized it early last summer, and has operated it during the past months. On the arrival of Commander von Waldersee the protest of the British bondholders was submitted to him, but he decided against them and the British acquiesced in the decision. It is stated that von Waldersee will now hand the road over to its rightful owners, or at least what is left of the road, for Russia, it is understood, has succeeded in obtaining the following concessions: (1) That Russia shall retain half the rolling stock of the entire railway for the section from Shanhaikwan to Niuchwang outside the Great Wall, which is also in Russian occupation; (2) that Russia shall hold a lien on the railway within the wall for the expenses incurred in repairs, although made with railway property, and in transport operations during the Russian occupation; (3) that Russia

shall appropriate the important workshops at Shanhaikwan with all their contents.

BRITISH PACIFIC CABLE.

THE recently awarded contract for the laying of the British Pacific cable from Vancouver to Australia via Fanning Island and Fiji, specifies that the line shall be laid by July 31, 1902, so that in eighteen months at the most the world will be belted by a complete cable system. Nine and one-half million dollars will be paid for the making and laying of the cable, which will measure, including slack, about 8,000 nautical miles.

Great Britain and Canada have agreed to defray five-ninths of this sum, New Zealand one-eighth, and New South Wales, Queensland, and Victoria have pledged to contribute the balance between them. It is proposed to charge 49 cents a word for messages to the United States and 25 cents additional for messages to Europe.

THE DEVELOPMENT OF SIBERIA.

THAT well-worn phrase, "The world of empire westward wends its way," is destined to be contradicted by the growth of Russia during the present century. One hundred years from now it is almost safe to predict the center of the Russian Empire in influence and enterprise, if not in population, will be east of the Ural Mountains.

The great tide of emigration, enterprise, and pluck that is following the iron rails of the trans-Siberian Railroad eastward are strikingly shown in a recent official publication of the Russian Government.

Siberia is roughly divided into two zones, separated by a broad belt of virgin

forest. The northern zone, cold and barren, stretches in an almost unbroken tundra to the polar regions. The southern zone is rich in those climatic and natural conditions that favor industry and perseverance, and it is this zone that the railway traverses.

During the two decades, 1860-1880, 110,000 people emigrated to Siberia; during the next 15 years this number had increased to 680,000, while during the last five years more than 1,200,000 persons, the majority sturdy Russian peasants, have settled there. The present population of Siberia is about 9,000,000.

So great has been the rush of traffic since the line was first opened in 1899 that the equipment has failed to equal the demands upon it.

Of the exports from Siberia corn, sent to the European markets, forms nearly one-half. Next come meat, butter (which is shipped in special refrigerator cars to London), tallow, hides, wool, eggs, and game. The chief imports are iron and ironware, sugar, cottons and woolens, machinery, and petroleum.

Even today, when the last stages of the Siberian road are not completed, the journey from London to Vladivostok by railway takes only a little more than half as many days, 24 to 42, as the journey by the Suez Canal. The easiest route between the two oceans is Havre, Paris, Cologne, Berlin, Warsaw, Moscow, Samara, Omsk, Tomsk, Irkutsk, Vladivostok—7,500 miles. Of this, 6,400 miles, or six-sevenths of the whole trip, fall to Russian railways—4,100 to the Siberian main line and 2,300 to the European-Russian system, 700 to German, 100 to Belgian, and 300 to French lines.

The traveler can reach Shanghai from London or Paris, when the main trunk line is completed, in 16 days, and will have to pay \$160 for his first-class sleeping-car express ticket, instead of being 42 days on the route and paying \$450 for the journey.

The total cost of the Siberian road to date, constructed as it has been by Russians with Russian money, with all branches and auxiliary undertakings, including vessels and ports, is \$385,000,000. In regard to this enormous cost the official report states:

"However large the total may be, it is insignificant in comparison with the advantages held out to Russia by the exploitation of the shortest railway route between the Atlantic and the Pacific, in conjunction with the stimulation of the rich productive powers of a vast country like Siberia and the development of Russia's commercial intercourse with the countries of eastern Asia."

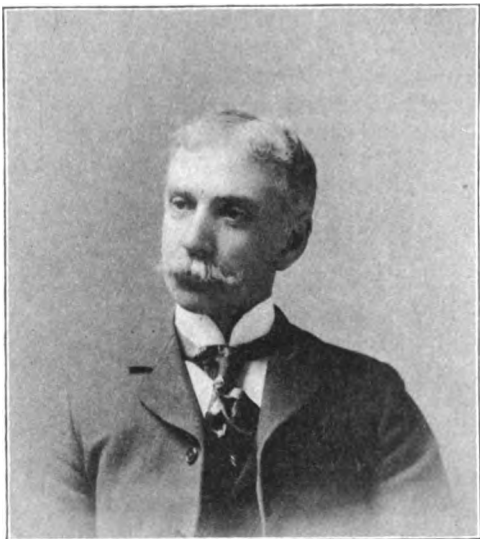
HON. O. P. AUSTIN.

MR. AUSTIN'S paper on a floating exposition, which is printed in the opening pages of the present number, was read by him before the National Board of Trade on January 24, at the special request of that body. The proposition, although a novel one, was received with such favorable consideration that a special committee, consisting of the leading officers of the National Board of Trade, the Philadelphia Museums, the National Manufacturers' Association, and the United States Export Association, was at once appointed to consider its feasibility, and, if found practicable, to formulate plans for a proper organization to put it into operation.

Mr. Austin has been Chief of the Bureau of Statistics since the spring of 1898, and during that time has prepared and published officially a large number of works on topics of current interest, including "Commercial China in 1899," "Commercial Japan," "Commercial South America," "Commercial Africa," "Cuba, Porto Rico, and the Hawaiian, Philippine, and Samoan Islands," "Russia and the Trans-Siberian Rail-

way," "The Colonial Systems of the World," "Submarine and Land Telegraphs of the World," etc., etc.

His earlier literary work prior to his entrance upon official life consists of a series of books on national affairs especially intended for the instruction of youth, including "Uncle Sam's Se-



crets," "Uncle Sam's Soldiers," while others of the series are still in preparation.

Mr. Austin is a member of the National Geographic Society, and as such his recent contributions to geographic and commercial information have been very favorably received and highly commended.

CUBA AND PORTO RICO.

THE U. S. War Department has recently published two volumes containing the results of the census of Cuba and Porto Rico, taken in the fall of 1899 under the direction of military officers.

The volumes are indispensable to those who wish to obtain an accurate understanding of the present condition of these people.

The facts presented in the reports were gathered in all cases by the people themselves, as the most intelligent of the better classes were induced to compete for positions as census-takers by the relatively handsome salaries offered by the U. S. Government. The facts thus gathered were classified under the direction of Messrs. Henry Gannett and Walter F. Wilcox, statistical experts.

* These handsomely gotten up volumes, containing many good illustrations, charts, and diagrams which emphasize the figures, can be obtained gratis on application to the War Department. Extracts from these reports, taken from advance sheets, have appeared from time to time in this Magazine, but some further notice may be of interest.

Porto Rico has only one-third of its population engaged in gainful occupations, while in Cuba the proportion is about two-fifths, and in the United States it is about midway between these two. It appears that the relative number of breadwinners is greater in cities than in rural districts. In Porto Rico a relatively larger proportion of women work for a livelihood than in Cuba, although the proportion is decidedly less than in the United States.

It is interesting to compare the kinds of occupation most popular in the islands. In Porto Rico sixty-nine in every 100 working persons labor on farms, plantations, in mines, or are engaged in fishing. In Cuba 48 in every 100, while in the United States only 39 are so engaged. In the manufacturing and mechanical industries, however, these proportions are reversed; in Porto Rico 8 in every 100, in Cuba 15, and in the United States 22 earn their living by transforming raw material into new forms.

THE ATLANTIC WEATHER SERVICE.

PROF. ALFRED J. HENRY, under the direction of the Chief of the Weather Bureau, has established during the last month a meteorological station at Hamilton, Bermuda. This station was needed to complete the chain of outposts planted at strategic points extending from the Lesser Antilles westward and northwestward to the British possessions. Bermuda is in the track of atmospheric disturbances which pass northeastward from the Florida coast, and which occasionally curve northwestward, striking the southern coast of New England. From this vantage point it will also be possible to forecast with greater accuracy the tracks of storms which occasionally develop great intensity in the Atlantic off the coast of the Carolinas.

Arrangements have also been made by the Weather Bureau for a daily cablegram from the Azores, giving the meteorological conditions in that part of the Atlantic, and also for a daily cablegram from London, summarizing the conditions west of Spain, France, and Ireland. As the forecasters of the Weather Bureau can now determine what conditions storms proceeding from the United States will meet, they are able to predict with considerable certainty the direction such storms are likely to pursue.

The U. S. Weather Bureau has already begun issuing to the captains of the trans-Atlantic liners predictions of the weather for three days out of New York.

The advance made in our knowledge of the laws governing meteorological conditions, and especially in the practical application of these laws to the interests of the mariner and the farmer, has been one of the most remarkable recent developments of science. Prof. Willis L. Moore, Chief of the U. S. Weather Bureau, believes that the time

may come when scientists will so thoroughly understand these laws that they can with certainty forecast the seasons.

THE U. S. WEATHER BUREAU AT THE PARIS EXPOSITION.

THE United States Weather Bureau exhibit was installed during the month of April and opened to visitors for inspection in completed condition May 15. The building remained open and the exhibit accessible to visitors every day, except Sundays, from 9 a. m. to 6 p. m., from May 15 to September 30, and from 9 a. m. to 5.30 p. m. during the month of October. It was necessary to close a half hour earlier during the month of October on account of darkness, there being no way of lighting the building artificially.

The exhibit was visited by many thousands of people, among whom were meteorologists and those interested in related sciences from all parts of the civilized world. The cloud photographs, the method of making weather forecasts, and the kite and aerial apparatus attracted special attention.

Many interested in aeronautics and air explorations examined the kite exhibit in detail, taking photographs and measurements of the kite, instruments, and apparatus. Notably among these were a number of officers of the German, French, Italian, and Japanese armies and navies.

During the meeting of the International Meteorological Congress, which brought to Paris representative meteorologists from nearly all parts of the world, a special invitation was extended to its delegates and members to visit and inspect the Weather Bureau exhibit. This invitation was accepted, and therefore the exhibit brought the methods, instruments, etc., of the United States Weather Bureau to the attention of those most interested in meteorological work.

It was the special effort of those connected with the exhibit to explain and set forth in the strongest and clearest light possible the aims and methods of the United States Weather Bureau and its practicability and great economic value to the people of the United States and of North America. Special stress was given to the great importance and the value of its weather forecasts and warnings.

As a result of the visit of the Jury of Awards and their critical examination, the United States Weather Bureau was awarded a *Grand Prix*. Gold medals were awarded to two officials of the Weather Bureau, Prof. C. F. Marvin for instruments, apparatus, and appliances, and to Prof. A. J. Henry for cloud photographs.

THE LOSS OF PROPERTY FROM LIGHTNING.

IN 1898 systematic efforts were made by the United States Weather Bureau to ascertain the frequency of damaging or destructive lightning strokes throughout the United States. The results of the first year's work were published in *Weather Bureau Bulletin No. 26, Lightning and Electricity of the Air*, and also separately as *Weather Bureau Bulletin No. 199, Property Loss by Lightning, 1898*. The collection of statistics bearing upon the loss of and damage to property was continued during 1899.

The total number of reports received of buildings struck and damaged or destroyed by lightning during the calendar year 1899 was 5,527, about three times as many as were received during the previous year. In addition to this number, 729 buildings caught fire as a result of exposure to other buildings that had been set on fire by lightning.

The great majority of buildings struck by lightning were not provided with lightning rods. A conservative estimate by Prof. A. J. Henry of the total

loss by lightning during the year would probably be \$6,000,000. One-half of the buildings struck were barns, sheds, warehouses, etc., and about 7 per cent churches and schools; cattle, horses, mules, and pigs were killed by lightning to the value of about \$129,955.

POLAR WORK.

PLANS for the Baldwin-Ziegler North Polar Expedition are maturing rapidly, for, unlike the majority of Arctic leaders, Mr. Baldwin is not hampered for want of funds. Mr. Ziegler, the multimillionaire behind the enterprise, has expressed a willingness to pay all expenses under one million dollars. Half a million was the cost of the Italian expedition of last year, and it was to the complete equipment that was thus possible that the Duke of Abruzzi partially owed his success.

Mr. Baldwin has chosen the Franz Josef Land route. He has had experience with Peary in Greenland and with Wellman in Franz Josef land, and is thus acquainted with the practical difficulties of both routes. Two ships will take the party north, one returning before the autumn ice blocks retreat, and the second remaining with the men through the winter. Mr. Baldwin plans to take a number of tough Siberian ponies with him. The chances are many against his being able to put them to any practical use, but the one chance is worth providing for.

The summer of 1901 will thus witness the simultaneous inauguration of the most systematic campaign to reach the North and South Poles that has ever been attempted. In the Arctic, Peary, Baldwin, Sverdrup, and a Russian party with a vessel of the type of the ice-breaking *Ermak* will push northward, while in the Antarctic two splendidly equipped expeditions, the German and British, will strive to reach the opposite extreme.

THE BRAZIL-FRENCH GUIANA BOUNDARY DECISION.

BY the award of the Swiss Federal Council, the arbitrators in the dispute as to the frontier line between Brazil and French Guiana, Brazil has obtained the main points for which she contended. Brazil obtains 147,000 square miles of the disputed territory and France not more than 3,000 square miles. The dispute dates back to 1688, when France claimed to the Araguay River, which is parallel to the Amazon. The boundary as determined by the award is the River Oyapoc and, from the head source of this river to the frontier of Dutch Guiana, the line of the Tumuck-Humack range.

The decision of the Federal Council of Switzerland is as follows:

"1. That the Japoc or Vincente Pinçon of article 8 of the Treaty of Utrecht is the Oyapoc that debouches to the west of Cape Orange, as has been established by the documents which Brazil has submitted to the tribunal, and that the *thalweg* of that river, from its mouth to its source, definitively constitutes the first of the frontier lines between Brazil and French Guiana.

"2. That the other frontier line, from the source of the Oyapoc to the point of junction with the Dutch territory, will be that which article 2 of the treaty of arbitration indicated as an intermediate solution—that is to say, the line of division of the waters in the Tumuc-Humac Mountains, forming the northern limit of the Amazon basin."

ALEXANDROWSK.

ALEXANDROWSK, the little arctic harbor built by the Russian Government on the Murman coast two years ago, is becoming a modest center of

arctic commerce. Although north of the arctic circle, it is free of ice the year round, as it is reached by an offshoot of the Gulf Stream.

A dam nearly 500 feet in length has been built to protect the harbor, which is deep enough for the largest ships. The town has now some 250 inhabitants, mostly officers and laborers, boasts 50 houses, a hotel, and several shops, and is lit by incandescent and arc lamps. The government does not expect the town to grow much larger, but it serves as an outlet for the trade of inland northern Russia, and is a clearing point for the considerable traffic of hides that come down the Obi and Yenisei Rivers.

A CORRECTION.

MR. LITTLEHALES has called attention to an erroneous statement in the note appearing in the January number of this Magazine, entitled "The Principles Underlying the Survey of the Bottom of the Ocean for an All-American Trans-Pacific Cable to the Philippines and the Orient." The correct equation to the curve which, by revolution around a vertical axis, would generate the theoretical form of an isolated submarine peak in which the crushing strength at any cross-section is equal to the combined weight of the portion of the formation above that section and of the superincumbent body of water is

$$y = \frac{\kappa}{\delta'} + \epsilon \frac{2\delta'}{\delta} \log x,$$

in which ϵ represents the base of Napierian logarithms, κ the coefficient of crushing strength of the materials composing the crust of the earth, δ the average density of these materials, and δ' the density of sea water.



Colonel F. F. Hilder.

DEATH OF COLONEL HILDER

FRANK FREDERICK HILDER, soldier, geographer, and ethnologist, was born in Hastings, England, in 1836; he died in Washington January 21, 1901. Educated at Rugby in the approved manner of the times, he afterward graduated from the British military school at Sandhurst, and entered the army as a cornet in early manhood, at a time when the eyes of all England were turned on India. Sent immediately to aid in quelling the Sepoy rebellion, he soon saw service of such severity—and met it with such intrepidity—that he was awarded the Indian Mutiny medal, with special-service bars for Delhi and Lucknow.

It was during this period of his career that Hilder traversed the Indo-Gangetic plain, trod the Himalayan foothills, and visited the provinces and cities of the northwestern empire from Bombay to Kashmir, and from the Punjab to Nepal, laying the foundation for a broad, yet precise, geographic and ethnologic education; and some of the lectures of even the latest years of his life drew inspiration and significant detail from the researches enlivening these early campaigns. He saw service also in Farther India, Borneo, and the Philippines, and after rising through a lieutenancy to the rank of captain was transferred to Africa. Here he won the Egyptian medal, and his skill as military expert and organizer attracted such attention that after his return to his regiment in India he was recalled and promoted to a colonelcy at the express request of the Khedive.

In Africa, as in India, Colonel Hilder seized every opportunity for scientific research; but his tenure in the Egyptian army was cut short by the terrible experience of a sand-storm, which so injured his eyesight that he decided to abandon a military career. Coming to America on his recovery, Colonel Hilder

met again the contagion of military spirit stimulated by our civil war, and did special work of importance in the Engineer Corps, but held so firmly to his election of a peaceful life as to decline an American commission. In the later sixties he became the international representative of a small-arms manufactory, and spent fifteen years chiefly in travel through the several Spanish-American countries; and during this period he acquired an extended and intimate acquaintance with languages and peoples, as well as with national leaders and policies. Impressed by the opportunities for international business presented by the actual and prospective republics of Spanish America, he established a house in Chicago, only to be ruined by the fire of 1871; later he combined business enterprises in St. Louis and Mississippi City with notable researches in the archeology of the Mississippi Valley. Unhappily pursued by conflagrations, he turned to research and publication, making important contributions to the projects of the Pan-American Railway and the Bureau of American Republics.

Colonel Hilder acted as secretary of the National Geographic Society during the year ending June, 1899, afterward becoming Ethnologic Translator in the Bureau of American Ethnology. He continued in this position to the time of his death, though he was detailed as a special agent of the Pan-American Exposition for work in the Philippines during the earlier half of 1900.

As indicated by his career, Colonel Hilder possessed remarkably strong character; yet he was by instinct a naturalist and student, and devoted the best energies of his life to the increase and diffusion of knowledge. His later publications, through the Bureau of Education and the Bureau of American Republics, as well as through the NATIONAL GEOGRAPHIC MAGAZINE,

the *Forum*, and other standard periodicals, are well known; while his graceful and instructive lectures, based on personal observations in India, Egypt, South Africa, Central America, the Philippines, and other remote regions, live in the memory of thousands.

W J M.

THE ORIGIN OF YOSEMITE VALLEY.*

MR. TURNER finds that the higher part of the Sierra Nevada has been glaciated, and in support of this belief instances numerous cases of glacial markings and morainal deposits.

If there is any one feature of the higher parts of the Sierra which stands out in bold relief, so that "he who runs may read," it is the fact that it has been covered by glacial ice in sheets and streams, and that at a very recent time. There is no need to search for glacial scratches or moraines. The whole aspect of the terrane is that of great sheets of bare granite, not yet covered with soil, with rounded surfaces, cut by deep U-shaped cañons, containing thousands of lake basins, and presenting cirques and hanging valleys; in short, everything in the field of vision tells the story of a wholesale ice invasion. Nor was it a brief one, but one which lasted for many centuries, during which cubic miles of rock were carried away, cañons thousands of feet deep were excavated, and the level of the country planed down to an enormous extent.

As to the potency of a glacier for the work of erosion, Mr. Turner is among the few remaining upon the negative side. His argument, however, simply

consists in a denial of the ability of a glacier to excavate gorges. That the gorges in the high Sierra were cut by glaciers is true nevertheless. They are plainly the result of channel, not valley, erosion, and channel erosion upon such a scale as this is done only by ice. The line of demarcation between channel and valley erosion in the cañons of the Sierra is clearly marked, and can be determined, one might almost say, to a foot—*i. e.*, the point at which the present visible marks of ice cease and those of water begin. I do not mean that the ice may not have excavated farther down the cañons, but that below certain points, easily distinguished, the subsequent action of water has masked that of ice. If other proof of the competency of glaciers to do the work of erosion upon a large scale were wanting, the presence everywhere of hanging valleys is in itself evidence conclusive. There is no other known agency which could produce them, and today we see them in process of production everywhere in glacial regions, notably upon the Alaskan coast, where there are thousands of them under construction before our eyes.

Holding such opinions concerning the erosive power of glaciers, it is to be expected that Mr. Turner attributes the creation of the Yosemite Valley to other agencies than ice; indeed, he attributes it to aqueous erosion, aided by systems of fractures in the granite. He finds no significance in the fact that Tenaya Cañon is vastly greater in breadth and depth, as he states, than could be created by the present Tenaya Creek. He passes over without notice the significant fact that every stream, excepting Tenaya Creek, enters Yosemite Valley through a hanging valley, and that the character of the Merced Valley changes abruptly and suddenly to a V-shaped gorge two or three miles below Fort Monroe, at the foot of Yosemite Valley.

It is perfectly obvious to those familiar with glacial phenomena that Yosemite is

* *The Pleistocene Geology of the South Central Sierra Nevada, with Especial Reference to the Origin of Yosemite Valley.* By Henry Ward Turner. Proceedings of the California Academy of Sciences, Vol. 1, No. 9.

quite an ordinary and necessary product of glacial erosion, under the conditions prevailing in that locality. The main glacier came down Tenaya Cañon, cutting it to a steep but fairly uniform grade. Yosemite Valley is but a continuation of that gorge. The end of the glacier, at the time that it was cutting Yosemite, extended not far beyond Fort Monroe. It remained there for a long time, and therefore plowed out the bottom of the valley to a considerable depth. Branch glaciers joined the Tenaya Glacier when it filled Yosemite, coming down the valleys of Yosemite, Little Yosemite, Illilouette, and Bridal Veil and other creeks, and forming hanging valleys at the junction points. The formation of the vertical cliffs of the valley may have been due to undermining, and may have been aided by the cleavage of the rocks. On the recession of the glacier doubtless the bottom of the valley was occupied by a lake, which has since been partially filled by detritus, and drained by the erosion of Merced River cutting through the rock-wall at the foot of the valley.

HENRY GANNETT.

GEOGRAPHIC NAMES.

THE following decisions were made by the United States Board on Geographic Names, January 9, 1901 :

- Bloyd ; mountain, Washington County, Arkansas (not Bloyed nor Bloyd's).
- Bobs ; creek, Lincoln County, Missouri (not Bobbs nor Bob's).
- Carroll ; glacier reaching the sea at head of Queen Inlet, Glacier Bay, southeastern Alaska (not Woods).
- Chiniak ; cape, the easternmost point of Kadiak, Alaska (not Greville. Hermogenes, St. Hermogenes, Spruce, Tolstoi, Tuniak, nor Yelovoi).
- Douglas ; bay indenting south coast of Kupreanof Island, Sumner Strait, southeastern Alaska (not Douglass).
- Grand Pacific ; glacier reaching Reid Inlet from the north, Glacier Bay, southeastern Alaska (not Johns Hopkins).
- Iskut ; mountain, and river tributary to the Stikine in southeastern Alaska (not Iskoot nor Skoot).
- Izhut ; bay and cape on southeastern shore of Afognak Island, Alaska (not Ijoot, Ishoot, Pentecost, Sharipof, nor Whitsuntide).
- Kates Needles ; mountain near Stikine River, southeastern Alaska (not Kates Needle).
- Kisselen ; small bay at head of Beaver Bay, Unalaska, eastern Aleutians, Alaska (not Kissialiak nor Worsham).
- Kupreanof ; strait between Afognak and Kadiak Islands, Alaska (not Karluk, North, Northern, nor Sievernoi).
- Mooneyham ; branch of French Broad River, Cocke County, Tennessee (not Moneyhan nor Mooneyhan).
- Mullin ; creek, post-office, and railroad station, Mills County, Texas (not Mullen).
- Nez Perce ; county in Idaho (not Nez Perces).
- Nishnabotna ; river in southwestern Iowa (not Nishnabotany, Nishnabotena, Nishnabotny, Nishnabotony).
- Reem ; creek, Buncombe County, North Carolina (not Reams nor Rims).
- Rendu ; glacier reaching the head of Rendu Inlet, Glacier Bay, southeastern Alaska (not Charpentier).
- Scajaquada ; creek, in Buffalo, Erie County, New York (not Seajaquada, nor Scajaquady).
- Yellow ; point on eastern shore of Tamgas Harbor, Annette Island, southeastern Alaska (not Signal).

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings.

November 9, 1900.—Prof. Willis L. Moore in the chair. Dr. M. H. Saville, of the American Museum of Natural History, New York city, delivered an illustrated address, "The Ancient City of Mitla, Mexico."

November 23, 1900.—Mr. Marcus Baker in the chair. Gen. A. W. Greely, Chief Signal Officer, U. S. A., delivered an illustrated address, "A trip through Alaska."

December 7, 1900.—President Graham Bell in the chair. Dr. W. A. P. Martin, President of the Imperial University at Peking, delivered an address, "The Siege of Peking."

December 18, 1900.—Mr. G. K. Gilbert in the chair. Capt. Ewart S. Grogan, the first white man to cross Africa from south to north, delivered an illustrated address, "From Cape to Cairo."

December 21, 1900.—President Graham Bell in the chair. Mr. Gifford Pinchot, Forester, U. S. Department of Agriculture, delivered an illustrated address, "The Proposed Appalachian Park."

January 4, 1901.—President Graham Bell in the chair. Mr. Joseph Stanley-Brown delivered an illustrated address, "The Franciscan Missions of Southern California."

January 18, 1901.—President Graham Bell in the chair. Mr. Arthur P. Davis delivered an illustrated address, "The Isthmian Canal Routes."

Technical Meetings.

December 14, 1900.—President Graham Bell in the chair. Papers were read as follows: "Winter Precipitation in Relation to Irrigation," by Dr. H. C. Frankenfield; "The Survey for an All-American Cable to the Philippines and the Orient," by

G. W. Littlehales; "American Arc Measures," by C. A. Schott.

January 11, 1901.—President Graham Bell in the chair. Papers were read as follows: "The Stenometer as a Distance Measurer," by W. J. Peters; "The Establishment of Compass Deviation Range-marks on Delaware Breakwater," by D. B. Wainwright; "A Topographic Cycle on Glaciers," by G. K. Gilbert.

Announcement of Meetings.

February 1, 1901.—"Mexico, Her Characteristics and Recent Progress," by Dr. Don Juan N. Navarro, Mexican Consul General at New York.

February 15, 1901.—"Explorations in Abyssinia," by Otis T. Crosby.

March 1, 1901.—"The Recent Famine in India," by Gilson Willets.

These lectures will be delivered in the Congregational Church, 9th and G streets, at 8 p. m.

TECHNICAL MEETINGS for the reading of papers and discussion will be held in the hall of the Cosmos Club on the evenings of February 8 and 22.

The committee having in charge the formation of the programs for the technical meetings of the Society desire to invite members to report to the Secretary of the Society the titles of communications bearing upon geographical research that are available for presentation to the Society during the months of February, March, April, and May, 1901.

The subject of the LENTEN COURSE of lectures for this year is "The Countries of Asia." The first lecture of the series will be at 4.20 p. m., Tuesday afternoon, February 26, in the Columbia Theater, 12th and F streets, Washington, D. C.

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PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings.

November 9, 1900.—Prof. Willis L. Moore in the chair. Dr. M. H. Saville, of the American Museum of Natural History, New York city, delivered an illustrated address, "The Ancient City of Mitla, Mexico."

November 23, 1900.—Mr. Marcus Baker in the chair. Gen. A. W. Greely, Chief Signal Officer, U. S. A., delivered an illustrated address, "A trip through Alaska."

December 7, 1900.—President Graham Bell in the chair. Dr. W. A. P. Martin, President of the Imperial University at Peking, delivered an address, "The Siege of Peking."

December 18, 1900.—Mr. G. K. Gilbert in the chair. Capt. Ewart S. Grogan, the first white man to cross Africa from south to north, delivered an illustrated address, "From Cape to Cairo."

December 21, 1900.—President Graham Bell in the chair. Mr. Gifford Pinchot, Forester, U. S. Department of Agriculture, delivered an illustrated address, "The Proposed Appalachian Park."

January 4, 1901.—President Graham Bell in the chair. Mr. Joseph Stanley-Brown delivered an illustrated address, "The Franciscan Missions of Southern California."

January 18, 1901.—President Graham Bell in the chair. Mr. Arthur P. Davis delivered an illustrated address, "The Isthmian Canal Routes."

Technical Meetings.

December 14, 1900.—President Graham Bell in the chair. Papers were read as follows: "Winter Precipitation in Relation to Irrigation," by Dr. H. C. Frankenfield; "The Survey for an All-American Cable to the Philippines and the Orient," by

G. W. Littlehales; "American Arc Measures," by C. A. Schott.

January 11, 1901.—President Graham Bell in the chair. Papers were read as follows: "The Stenometer as a Distance Measurer," by W. J. Peters; "The Establishment of Compass Deviation Range-marks on Delaware Breakwater," by D. B. Wainwright; "A Topographic Cycle on Glaciers," by G. K. Gilbert.

Announcement of Meetings.

February 1, 1901.—"Mexico, Her Characteristics and Recent Progress," by Dr. Don Juan N. Navarro, Mexican Consul General at New York.

February 15, 1901.—"Explorations in Abyssinia," by Otis T. Crosby.

March 1, 1901.—"The Recent Famine in India," by Gilson Willets.

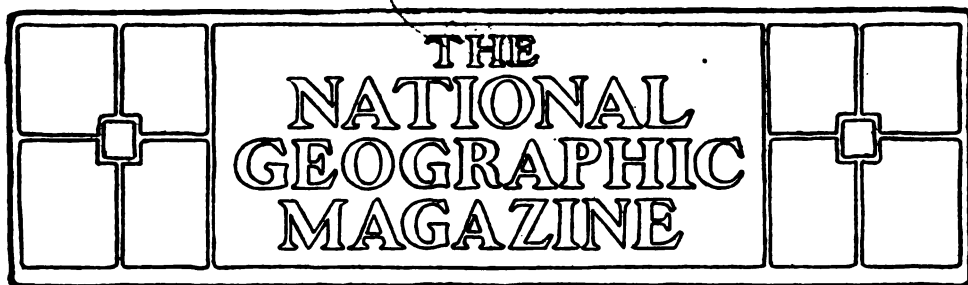
These lectures will be delivered in the Congregational Church, 9th and G streets, at 8 p. m.

TECHNICAL MEETINGS for the reading of papers and discussion will be held in the hall of the Cosmos Club on the evenings of February 8 and 22.

The committee having in charge the formation of the programs for the technical meetings of the Society desire to invite members to report to the Secretary of the Society the titles of communications bearing upon geographical research that are available for presentation to the Society during the months of February, March, April, and May, 1901.

The subject of the LENTEN COURSE of lectures for this year is "The Countries of Asia." The first lecture of the series will be at 4.20 p. m., Tuesday afternoon, February 26, in the Columbia Theater, 12th and F streets, Washington, D. C.

MAY 6 1901



THE LATIN-AMERICAN CONSTITUTIONS AND REVOLUTIONS

BY JOHN W. FOSTER, EX-SECRETARY OF STATE

ON attaining their independence, the Latin-American republics modeled their forms of government after that of the United States. In almost all their constitutions the article relating to the executive power, like that of the United States, contained no prohibition against the reelection of the President. But a bitter and bloody experience has caused them, with nearly the same degree of unanimity, to revise their constitutions in this respect.

The provisions of the existing constitutions of those countries relating to the executive may be briefly enumerated as follows: In Mexico the president is chosen for four years by an electoral college, and no prohibition exists against a reelection. The cause of this exception to the general practice will be referred to later. The secretary of foreign relations succeeds to the presidency on the death or disability of the president and orders a new election. In the five Central American States the provisions vary as to the manner of election and term of office, but in most of them the president is made ineligible for reelection

for the next succeeding term. So, also the prohibition against reelection to be noted in the countries which follow is in almost all cases for the next succeeding term only. In Colombia the president is chosen by an electoral college for a period of six years, and is made ineligible for reelection. Ecuador elects its president by the direct vote of the people for the term of four years, and he cannot be reelected. The vice-president is elected for the same term, but two years after the president. Peru elects its president by a direct popular vote for four years, and he is made ineligible for the next four years. Two vice-presidents are elected. Bolivia has the same provision as Peru. In Chile the president is elected by delegates chosen by the people for the term of five years, and he is made ineligible for the next term. The Argentine Republic elects its president by electors chosen by the fourteen provinces for six years, and both the president and vice-president are declared ineligible for reelection. In Uruguay the president is elected for four years, and made ineligible for the suc-

been satisfactory enough on a full-sized mule.

Here, also, through the kindness of the American mission, I acquired a very doubtful asset in the person of a shopworn, old Abyssinian, who had left his native land as a boy and had been too much cared for by a succession of missionary friends, who had brought him up into a softened old manhood. His qualifications were honesty, a knowledge of the two principal Abyssinian tongues, together with sufficient English to keep me from going mad; and a helplessness which assured his fidelity to me when we were in strange lands.

With about twenty boxes of provisions and the ancient Michael Gabriel, I took ship at Port Said on a tramp vessel bound for Aden. Until the comparatively recent establishment of Jibuti, in French Somali Land, Aden was the only seaport near this portion of the African coast which one could reach by steam vessels plying to or through the southern end of the Red Sea.

It would have been possible to take an Italian ship for Massawa, and to begin there the journey toward the interior, but I was told, and could well understand, that the sad disasters suffered by the Italians in recent years had reduced Massawa to a point of almost negligible importance, and, moreover, there I would have had more difficulty in obtaining the necessary consent from Menelek for the interior journey than at Jibuti or Zeila.

Aden is famous the world over as one of the hottest and in all natural ways one of the most detestable places frequented by civilized man. My first day or two at this point, housed in one of the two strange little inns which the traveler may find, quite bore out the popular conception of the place; but soon acquaintance with the hospitable British officers made the place seem to me quite a pleasure resort. I saw then, more clearly than in Cairo, which is now

quite European, the splendid talent of our British cousins for making themselves and their guests almost comfortable and entirely contented in all sorts of conditions.

A score of forgotten, but at the last moment much desired, articles were obtained, and all the purchases were found in good condition when I arrived in Zeila save only that the sea biscuit, which I had ordered to serve as bread, had been forgotten by the packers. The result was the important discovery that one can get along tolerably well without bread.

A little steamer coughs its way across once a week from Aden to Berbera, thence to Zeila, thence back again. On this Michael Gabriel was sent a week ahead with instructions to deliver a letter to Captain Harold, the British officer in command at Zeila, and, with his permission, to get together some camels.

When I reached Zeila, Michael seemed to have gotten close to only one camel. That one had managed, even with its soft pad, to kick Michael's shin into collapse and make him mourn the difference, which he declared to be well marked, between the Somali camels and his humped brother of Asia Minor and Egypt.

A few Somali servants had been engaged in Aden, one of whom tried to desert when the little ship stopped at Berbera, but we were finally landed safely, carried in chairs on the shoulders of strong, young natives through the shallows to the shore. Zeila is a seaport, not a harbor.

Captain Harold put me up at his modest Presidency, and his kindness followed me at every moment in all the detailed organization of the caravan. A trade with camel men was made at so much a load for the distance from Zeila to Gildessa. Additional and trustworthy men were engaged for my personal services, and happily two small mules, the only two in Zeila, were sold to me as saddle animals for myself and companion.

As I had a very natural desire to see French Somali Land, I went over in a day's sail in a native boat from Zeila to Jibuti. This seaport is not more than ten years old, has about eight thousand inhabitants, loyal natives, and is already rather neatly built—a low-roofed, white, tropical French town with a good harbor. Ships of the M. M. line stop about twice a month, and, more than all, as to its future importance, it is the starting point of a railway which French capital has pushed to the interior. A year ago the work was completed for a distance of forty miles, with considerable preparatory grading for some distance ahead. The workmen must be guarded at all times by soldiers, who are for the most part from the west coast of Africa. There is an occasional outbreak; a few Italian or Arab laborers are killed by a rush at night; yet through it all the patient stockholders in Paris are backing up the efforts of their representatives, who are building a railway that may be small, indeed, in commercial value, but, on the other hand, may have a very large political significance. At least it may be said that this railway enterprise does very much to offset what would otherwise be the preponderating influence of Great Britain upon the future Abyssinian question, due to the large British possessions which almost surround Menelek's domain.

I found in Jibuti that arms were sold in very large numbers, and indeed all caravans which I saw starting for the interior during three or four days' stay bore boxes marked "*cartouches*." Nearly all imports to Abyssinia other than arms go by way of Zeila.

Having finally chaffered myself into the ownership of a third mule, I started back to Zeila, across the desert, accompanied by a follower who had walked across a night or two before. There was really no great danger, since the whole coast is under the power either of the French or English, but a white man with-

out arms is not thoroughly understood by the natives, and the killing of any man in any manner reflects great credit upon the slayer. Indeed, it was feared that a weaponless white man might be considered as a derelict which could not be put to better use than by a kind of innocent slaughter, quite without personal animus. However that may be, I got across the desert, a distance of forty miles, in about eight hours of very hot riding, relieved by a very splendid mirage effect on approaching Zeila, whose low dingy houses became a glittering row of splendid white palaces.

Finally sixteen camels, with proper loads, were gathered, a well-defined bargain was made for their hire, and we drifted out upon the desert, camping only eight miles from Zeila the first evening. Here the sweet silence of the desert fell upon us, broken only by the chatter of men and grunt of camels; then the night finds its true voice, the complaining cry of the hyena. Subsequently in the long march one day was very much like another, so far as the movement of the caravan was concerned. Little difference was made even by changing transport to mules, for with either animal the average journey, when not carrying food, must be in the neighborhood of twelve miles a day.

The African camel starts out on such a journey with no stored-up fat, and he must have a few hours a day in which to nibble at the thorn bushes, which are found almost everywhere in this east shore desert. The mule cannot subsist on thorn bush; hence he is not used in this region, but in the grassy country he must have a few hours for grazing, so that substantially the day's march averages not more than five hours.

When it comes to mountain-climbing the camel is very inefficient, and is rarely used. The little barefooted mule, native to Abyssinia, is the only and very excellent means of transportation. He carries about 120 pounds weight, and con-

tinues to carry it when his back and side have become lacerated to a most sickening degree. These mules are bought at the average price in our money of \$25, and horses for about half that sum. They can be more readily had for purchase when one has reached the Abyssinian country than camels can be had in Somali Land.

At Harar the donkeys and camels are dropped and the mule, whose services thereafter are almost universal throughout Abyssinia, comes into use. For the journey to Addis Abeba a mule caravan of twenty-five mules can be gotten together in the course of a week at Harar, if one is very industrious, but it would be impossible, apparently, to get any one man to contract for twenty-five mule loads. There were in my small caravan of twenty animals six independent owners. Fortunately they all have pretty nearly the same habits and this constitutes the only bond between them.

Having become after the first ten days' march from Harar quite desperate on account of daily disputes as to where we should camp, I insisted upon the appointment of one spokesman with whom I might deal every evening in determining the following day's march. All solemnly agreed to stand by such decision as their chosen spokesman and myself might reach, and they held to the agreement for just two days. I learned, however, that they were not altogether a vicious lot; they were merely stubborn children, so far as conduct was concerned, and, moreover, in respect to the marches which the mules could stand, were much wiser than I.

My agreement was that I should be landed in Addis Abeba in twenty-five days from the start at Harar, and after all my vexations they carried out that part of the contract. Two-thirds of the contract price was paid at the beginning of the journey, the remainder in Addis Abeba. They all expect something in the way of *backsheesh*, and those who had

been most troublesome were, of course, most importunate.

In pushing beyond Addis Abeba it was impossible to get a hired caravan, as there is no such regular means of conveyance. I was able, however, after a twelve days' stop, to purchase seventeen mules; but this was by happy chance, due to the fact that Colonel Harrington, the British diplomatic agent, had thirteen of these mules already in hand, left in his care by some English traveler who had passed through eight or ten months before. Here also, hoping to find the horse a little more variable in his paces than the mule, I bought two, one for my assistant and one for myself. It was a relief as compared with the slow dog trot of the mule; but in the exceedingly rough marching which had to be accomplished on reaching the Blue Nile, the horses soon played out. One of them had to be shot, and the other was turned into the caravan and bore about half a load.

The camel men from Zeila and the Somali, whom I had engaged as personal attendants, were all Mohammedans.

The mule men from Harar to Addis Abeba were Abyssinians, but of mixed faith, there still being a considerable Mohammedan element in southern Abyssinia, due to a great invasion which took place two or three hundred years ago under a leader who was doubtless of Arabian family and whose first followers were the Mohammedanized Somali. Many Galla, who constitute one of the most widely distributed people in north-east Africa, were also converted and many have been permitted by their present rulers, the Abyssinians, to retain their faith.

From Addis Abeba on to the Sudan my followers were of Abyssinian Christian creed, with only four or five Mohammedans, these being the Somali who accompanied me from the coast throughout the journey. Although they could not eat of the same food, there was not

a great deal of friction between the two tribes. On several occasions, when I was lucky enough to shoot a deer, a Somali and an Abyssinian would enter a good-natured foot race, each with drawn knife, the winner being able to give the finishing cut-throat blow to the animal and thus obtain for his companions fresh meat which the others would not deign to touch.

The mule caravan was used to carry me through all the known and unknown country from Addis Abeba northwesterly to Famaka, on the Blue Nile, where at last a white face was seen again—that of one of those solitary young English officers who may be found in so many faraway spots doing the empire's hardest work. At Famaka the caravan was dismissed, the men returned to Abyssinia, and the rest of the journey to Khartum performed in a native boat, which was rowed and pushed down the river 450 miles in thirteen days.

The country which I traversed may be divided, so far as physical characteristics are concerned, into three parts:

First, the Somali desert lands, extending from the coast to the neighborhood of Gildessa. In this region water is to be had only by digging holes in the sand, some of which remain in a tolerably permanent condition, so that it may not be necessary for each caravan to freshly scoop the day's supply. In other places the natives have learned from experience that in the dry river beds water can be found from one to six feet below the surface, and the position of the camp is determined accordingly. The men refused to use the spade and shovel which I had carefully provided, and scooped a hole with their hands, and in the course of five or ten minutes the bottom of the hole would fill with trickling water, quite brown with sand but otherwise good.

In this region a hot night follows a hotter day; yet there is a sort of cleanliness due to the lack of moisture, and

one feels less than might be supposed the absence of water for bathing purposes. Indeed, on several occasions I learned by experience that Mohammed was speaking merely the ordinary practice of his desert-dwelling people when he prescribed the use of sand as a substitute for water in the execution of those ablutions which his creed orders as a part of religious duty. The desert is not entirely of sand. Sometimes it is rather sandy than sand, and in such cases it is generally widely covered with large and small volcanic stones. It is a land of desolation, but a land of peace, and few who have seen it but would gladly go there again for rest.

The next region, the great Abyssinian plateau, shows rather barrenly in spots, but for the most part is a tolerably well-watered and pleasing country. There are wide, rolling prairies, which show brown toward the end of the dry season, but are green during the rainy season and the earlier part of the dry. Splendid trees are found on some of the mountain sides and elsewhere in isolated groups, but, generally speaking, there is a sad dearth of forest growth.

After the exceedingly arduous work of climbing up the sides of this great escarpment, one may travel for many days over easy country. It is this great plateau which the Abyssinians have held against all comers for so many centuries, and now that they have the rifle it will be a bloody task for men who would dislodge their power over it.

This great region is cut deeply in two by the Blue Nile, whose waters run in a chasm five thousand feet below the plains, where I first crossed it, and about the same level at the two other points where I was able to descend to it. It was this upper Nile region and the region lying at the foot of the westernmost escarpment along the Blue Nile which had not heretofore been visited by white men. The descents were made chiefly on foot and were very difficult.

The third region is that into which one descends in the neighborhood of Wombera, and where one finds, after a very few days' march from the foot of the mountains, the beginning of the characteristic Nile scenery. The country is flat, covered for the most part where neglected, with the mimosa, which here grows to a considerable height, although it is a very near relative of the stunted thorn bush, familiar on the Somali plains. The palm, however, and a number of other good wide-spreading trees of the fig family appear to relieve the ugliness of tree-life. I shall not be able now to describe in any detail the splendid physical features which impress one on passing over the great plateau and in crossing the Nile, the Tchencha, the Bolassa, and other inflowing streams.

It will be sufficient to say that the western part of Abyssinia upon which I am now able to report to the civilized intelligence is a beautiful region, quite as attractive as any of the already known portions of the Abyssinian plateau.

As to the peoples met with, they were the Somali, already familiar to travelers; Abyssinians, about whom much has been said and of whom I shall give some of my impressions; the subservient Galla, the Agaa, the Shankali, the Sudanese, and the Shinasha, a small but interesting tribe, unknown, I believe, until this journey was made.

The great part which the Sudanese have played in the drama of modern Egyptian history is already known.

The Somali is not likely to attract the world's attention in any great degree, as he is now quietly subject to a British protectorate in the country back from the Berbera and Zeila coast and to a French protectorate in the small region around Jibuti. There are, perhaps, not more than half a million, and many of these are becoming more or less civilized by reason of the influence of the coast towns.

What struck me particularly in British

Somali Land was the fact that three Englishmen constituted the whole white force engaged in the business of this protectorate. There are some East Indian assistants and a few East Indian troops, thirty-five or forty in all. There are some Greek, Armenian, and East Indian merchants in Berbera and Zeila. The control seems to be largely a moral one, so far as direct influence is concerned, based on a clever handling of the tribal chiefs, who are kept in the coast towns as "justices of the peace," but in reality as hostages.

MENELEK.

Of the Abyssinians, Menelek is the greatest, not because he is the king, but he is the king because he is the greatest. He is emperor of the Abyssinians by virtue of having conquered a great many difficulties, most of which yielded only to the sword or rifle. He is not of that pure Semitic stock which some thousands of years ago seems to have come over first and to have later received reinforcements, from time to time, across the Red Sea from Arabia, and even from Judea. His father was of a kingly family that professes to trace its ancestry to a union between Solomon and the Queen of Sheba. Our accepted authorities in respect to Solomon do not mention this particular *amour*, but that may have been merely overlooked by time.

Menelek's mother was a woman of low origin, and it may be that this cross-ancestry, while depriving him of the pure, finely chiseled facial type which many of his nobles have, and giving him the negroid face instead, may have added something of vigor, since we know that to be too pure-blooded means sometimes to be thin-blooded. One may fairly say that, while having the advantage of noble paternity, Menelek has fairly fought his way to power.

He is eagerly curious to see all new things that Europeans have painfully

brought up to his court, five hundred miles by caravan; yet, of course, he cannot make use understandingly of more than a few. I remember when first presented to him, as he sat in a doorway of the largest room in his residence, a rather confused mass of presents; Sèvres vases from the French Government, phonograph boxes, sextants, and such objects were piled up behind him. He received me by appointment, through Colonel Harrington, who with his assistant, Mr. Baird, had given me the hospitality of their compound. The black, kindly face indicated patience as well as strength, and his manner was that of quiet dignity.

Following the well-established custom, I had with me a few gifts to present to His Majesty, who had sent me goats, bread, and tej. Two large volumes, with illustrations of scenes of our own country, of its cities, mountains, waterfalls, etc., I offered in the hope of making known the land of the free. Through the very excellent interpretation of a young Abyssinian attached to the British agency, I endeavored to explain the geographical relations of the United States to the rest of the world, but I am quite sure that I did not make a brilliant success. The difference in time between New York, which I mentioned as being our biggest city, and Addis Abeba seemed to interest His Majesty very much, but not understandingly.

Menelek seemed to have some appreciation of the magnitude of the Brooklyn Bridge and of the Capitol, yet the absence in his own language of any defined measure of distance left me doubtful as to whether, in spite of his unceasing efforts to understand things European, he is really able to mentally interpret such great dimensions. He has never seen a house larger than his own, unless possibly the neglected ruins of a considerable building erected by the Portuguese about 300 years ago in Gondar, once Abyssinia's capital.

As the Abyssinian is unable to make anything save the round hut, the royal residence was built by East Indian carpenters of rails wotted together and more or less heavily covered with mud, the roof being straw and mud thatch. This palace or Gébi might pass for a fairly comfortable country house, shabby for want of paint. Nor has Menelek ever seen a boat, save the sections of one of poor Marchand's little flotilla lying covered up in front of the Gébi hundreds of miles from any navigable water, telling in its mute, sad way of Fashoda, that well-known story of bravery and blundering.

What I most relied upon as clinching in the royal mind a tolerably defined idea of our country were the pictures of some of our cotton-manufacturing establishments in New England. This I described as the place where were manufactured practically all the cotton goods which constitute the clothing of all of his most advanced subjects. I had noted with surprise and pleasure in Aden, Zeila, and Harar that American cotton goods were the only cotton goods in evidence.

Referring to a map, I further explained that another English-speaking country lies to our north, and that this country was a part of Great Britain's empire. So far as my object of instruction was concerned, I think in this point I overdid it. This reference to Canada, with my statement that all the people in my country spoke English, coupled with the fact that I came in a certain sense under the wing of Colonel Harrington and accompanied by his interpreter, evidently left a blurred impression of my relation to the American eagle. At any rate, when finally written permission was given to me to go into the unknown country to the northwest, I was described as Mr. Crosby, *the Englishman*.

The Emperor was clad in modest, even severe, garb, the chief vestment being

a black-silk burnous. He wore stockings, but no shoes. A tightly drawn turban covered what is said to be a well-developed baldness. Menelek is a hard-working ruler, rising at three or four o'clock in the morning to receive reports that have come in by mule courier from various sections of his empire and to dictate responses.

He is said to be unable to write, and perhaps would consider it undignified to use the art if he possessed it. Till nine o'clock in the morning he is busy with his dispatches, and, it may surprise Americans to know, conducts business with Harar, his most important town, about 200 miles away, by a telephone.

There is nothing more bizarre than to find a long-distance telephone line in this kingdom, which is, so far as mechanical arts are concerned, very benighted; yet as one follows the main highway of the kingdom by toiling over mountain trails, which almost defy even the patient mule, one scarcely loses sight for a distance of nearly 200 miles of the familiar telephone pole. This is the work of a few enterprising Frenchmen, the same who are at the head of the Jibuti Railway enterprise, aided by a Swiss, M. Ihlg, who has been the right hand of Menelek for something like twenty years.

How much there is of the commercial, how much of the political element in this extraordinary work of these Frenchmen, I do not venture to say. They undoubtedly appear to Menelek as the chief interpreters of all the glories of our mechanical civilization. His army is supplied with their rifles and cartridges, and may the day be long distant when these French-made bullets shall be directed against European troops of whatever nationality.

After nine o'clock Menelek is ready to receive those of his subjects, great or small, who claim access to him, and also the occasional European who travels to this strange mud-hut capital. He has

learned that there are some costumes appropriate to ceremonial occasions, and out of respect to this knowledge I had been advised by Sir Rennell Rodd to take a dress suit for presentation to the court, and this I donned at nine in the morning and in it rode the mile and a half or two miles separating the British compound from the Gêbi.

When these visits have been completed Menelek gives much detailed attention to the buildings and the meager workshops which his East Indian employés have set up for him.

His capital city contains huts, large and small, which may lodge a population of about ten thousand. A considerable part of this city is still of canvas.

The extremely cold nights, with a temperature sometimes as low as forty degrees Fahrenheit, after a day of one hundred degrees in the shade, have caused the Abyssinian on this high plateau to want some shelter.

My Somali servants, who suffered far more than the plateau people, were with difficulty forced to put up tents which I had provided for them, their life-long habit of sleeping in the open air being hard to break.

The difficulty of obtaining firewood will probably necessitate the moving of the capital within the next fifteen or twenty years. As there are no roads, a wheeled vehicle being unknown, firewood must be brought in by hand from the surrounding forests; and as the nearby timber is destroyed, this difficulty will soon become one of great moment.

Several deep ravines cut the town into three or four sections, and in the rainy season these sections are permanently separated from each other, bridges not being attempted.

In the whole kingdom I think there are three permanent bridges. One of these is over the Hawash, which must be crossed in order to reach Harar and the coast. This bridge was built under

the direction of M. Ihlg. Two other bridges, of stone, one of which I crossed north of the Blue Nile, were constructed years ago under the direction of some Greek priest.

The Abyssinian seems quite unable to follow the lead of any such work and is capable of only the most rudimentary accomplishments in mechanical arts; he can work a pretty good saddle of wood, he fashions a fair piece of metal into a sort of spear, and he can make, as already described, a tolerably tight hut, without a chimney, and weave a loose, rather comfortable, cotton or woolen garment.

The paltry ornaments which are found in the market places are not better than many that some of the typical African tribes can make.

Nevertheless the pure-blooded Abyssinian shows his Arabic origin, as, in spite of this very low development in the mechanical arts, he stands head and shoulders above all ordinary African people in the development of his language and his religious ideas.

Except when dealing with the black tribes whom he has subjected, Menelek carries on the business of his government by written orders in the Amharic language, the common spoken medium. It is of Semitic derivation, as is also the language of their holy books, now extinct save in some remote parts of the province of Tigré. This ancient language is known as Geez, and in it those books of the Bible with which they are most familiar are preserved. It is to be remembered that these people were Christians when our forefathers were painted blue and worshipped Thor and Woden. A shipwrecked priest from Alexandria somehow made an easy convert of the reigning king about the year 330 A. D.

The country is dotted with big round mud huts, which are churches. The priestly order, although vastly ignorant, is not without power. They inculcate,

doubtless in good faith, many superstitions, but with it all are firm believers in the principal tenets of the Christian doctrine.

I found by inquiring of a priest in a small far-away village that he was unable to read the sacred books which he sold to me. He said that was the business of the high priest.

Rude paintings are found on the partitions inside the churches, representing various saints, cheek by jowl with such dignitaries of the Abyssinian social order as had contributed to the making of the church. The artists are not typical Abyssinians. In considerable part, so I was told, the work of the churches is done by the Falasha, remnants of a Jewish tribe still stubbornly living apart and maintaining the Jewish creed and considering themselves defiled by conversation with Abyssinians.

No one can doubt that Jewish influence was at one time very great in this territory, and it seems to me highly probable that Frumentius, who converted the Abyssinians to Christianity, may have found his task the easier because of some perverted knowledge of the Jewish prophets.

At a later date, about the year 1000, a Jewish princess, Judith by name, established her family on the throne, which held sway for something like 200 years.

Altogether it may be said that the origin of the Abyssinian people fully warrants the Arabic word "Habeshi," from which we have our word "Abyssinia," and which means mixed.

It is possible that before the Semitic invaders settled in this fertile land some small influence from the great Egyptian civilization around the mouth of the Nile had been pushed up and up along the stream, through the desert, to where it must have been merged with the native element, presumably black, then holding the soil. I feel convinced that this influence must have been small, because of the very great difficulty with which in-

tercourse could have been maintained between this upper region and lower Egypt. For a thousand years the Abyssinians were cut off from the rest of the world, and maintained the Christian doctrine as implanted by Frumentius.

Then came a period of contact with the Church of Rome, through the efforts of Portuguese missionaries and soldiers, at a time when that brave little kingdom sent its intrepid sons to every quarter of the globe. This missionary effort, however, added a very bloody chapter to the history of Abyssinia, and finally all white men were expelled, and again the gates were closed, and a period of something like 150 years elapsed before any further knowledge was had of things Abyssinian.

Since that time travelers have given very complete accounts of the country and its people; the touch with Europe has been again made intimate and bloody, through the efforts of the Italians to extend their power over Abyssinia.

This effort closed in the terrible tragedy at Adowa, where the flower of the Italian army was destroyed by Menelek's hosts. In spite of the errors, which it is easy now to mark, in the conduct of the Italian army, I feel very strongly that the Adowa campaign must have more nearly represented the probable outcome of any other European effort against united Abyssinia than did the Magdala campaign which the British conducted in 1867. Theodore, the emperor, after years of factional strife, was bereft of nearly all his followers when a British force, consisting of 13,000 men and 7,000 camp-followers, took, without the loss of a single life in action, the stronghold in which he had been left by his own people.

Attached now to the British agency as a sort of pensioner is a certain Irishman, wholly Abyssinianized, who was one of the servants of these imprisoned officers whom the great army at Magdala released. He was pointed out to

me by Colonel Harrington as representing something like £2,000,000 to the British Government, that being the *pro rata* cost of saving the lives of Theodore's captives. He cannot be disposed of at cost price.

Due to the trouble which the white man seems to have brought into his country, Menelek has been, for one so eager to tread the path of civilization, rather slow to give permanent hold to white interests. The concession to the railway people was a marked departure, and subsequently the concession to some English mining people for work in western Abyssinia marks another step toward progress and national destruction.

Menelek is indeed at the parting of the ways, and all the while is earnestly seeking the betterment of his people as well as his own glory. I believe he is leading them to the brink of destruction. Such are the ways of the Omnipotent in bringing about the spread of what we call civilization, to drink of whose cup is to the barbarian to drink of poison. What will happen when Menelek dies, nobody knows. If some strong man of the "Abyssinia-for-the-Abyssinians" variety can grasp the reins, the autonomy of the country may yet be maintained for a long while, and together with it the ignorance of the people.

Their Christianity sits upon them lightly, as I found, for example, in respect to the institution of polygamy.

Menelek himself sets an example of monogamy, having one wife, who is a woman of considerable influence and of very good heart. But many others have not received that part of the Christian doctrine which forbids more than one wife and live more or less happily with several wives in the same household.

SLAVERY IN WESTERN ABYSSINIA.

In respect to polygamy's monster twin, namely, slavery, many of the Abyssinians are quite ready themselves

to capture slaves from the inferior and more lowly developed tribes as well as to hold them in slavery when caught by some one else. Theoretically, there is no slave trade in Abyssinia, and in fact it is pretty well controlled. In the region which I traversed, where no whites had preceded me, there were still one or two slave markets, and I rather expected to see the trade going on openly; but Menelek's lieutenants know that he has engaged with European powers to put down the slave trade. They were therefore surprised that I had been permitted to enter that part of the kingdom where the traffic is still maintained.

When I asked where I could buy two or three boys, one of the chiefs, who had escorted me for several days, good naturedly said, "You white people have stopped that, but," he said, "there are robbers from whom you may buy on the sly," and indeed at Wombera a small boy was offered at my tent for 37 Maria Theresa dollars, equivalent to about half that sum in our money.

There were, however, no public offerings, although I chanced upon the market day, but the chiefs had, so my interpreter informed me, given orders that no public traffic should take place.

Indeed the presence of a white man on the market ground stampeded the whole performance, not through fear, but through curiosity. There were perhaps three or four hundred people gathered together for bartering, and the whole of them—the last man, woman, and child—arose and followed and pressed upon myself and assistant as we walked about, but apparently with no ill-humor.

The night before the natives had refused to sell us food, but finding no harm come of our presence they changed their tactics and I was able to obtain one chicken and twelve eggs for three blue beads. Eggs are not eaten by the natives. Careful inspection of their stores is therefore necessary.

The next day we met a long caravan of slaves marching up from the country south of the Nile. The caravan seemed to belong to a rather striking-looking woman, who was the wife of a great Abyssinian personage dwelling far to the north. She and her lieutenants had been in Shankali Land and had obtained (by purchase, let us presume) a goodly number of black fellows. These are offered for sale by some bold neighbor or relative. Where these slaves were seen by me in service around Monkorer, which is a considerable town, and in the smaller villages westward, there was nothing of brutality or special hardship of any kind apparent in their surroundings.

We passed through a section of country not yet thoroughly subdued by the Abyssinians and inhabited sparsely by the very people from whom the slaves were drawn. How far these very low savages prefer the debasement in which nature holds them when free to the conditions created for them by superior masters, I cannot state. The fact is that a wide gap exists between them and their Abyssinian lords, and that the physical surrounding of the Shankali when with the Abyssinian, crude as all that surrounding may seem to us, is far less crude than that which he creates for himself.

Those who finally accept the sovereignty of the Abyssinian are not subject to slave-raiding, but are permitted to live peaceably enough in their own fashion at the expense of some small tribute to the Abyssinian lord.

The dominion of the Abyssinian power is now established as far west as Wombera, where I left the most westerly Abyssinian post and descended to the Nile plains below.

The whole region beyond has been terribly swept by war and slave-trading. It is yet without government, although there is a merely nominal sovereignty claimed by Menelek. As a matter of

fact, each village—and there were two—seemed to stand entirely alone. The people hid away from before my small caravan, and I had very great difficulty in obtaining guides. While in Abyssinian territory these guides had been impressed by force or blows when necessary and at the command of the Abyssinian dignitary who accompanied me.

When I wanted to descend to the gorge of the Nile, the fine old gentleman, who was chief of the region, ordered some of the local natives, Agaa by name, armed only with spears, to go down with me, his own soldiers somehow not wanting to make the venture.

The river bottoms were said to be filled with warlike Shankali, armed with spears and poisoned arrows, and who had been forced to these narrow confines by lack of food, as along the river they could get an occasional hippopotamus and live upon that for a long time. My native escort was absolutely cowardly and got into a blue funk over the few footprints that appeared near the river, and I had to promise to protect them with four of my own men, but insisted that they should show us the way. The Shankali appeared only on the far side of the river, just a few black, naked fellows, who made a great pow-wow, and were evidently wholly unequal to the task of attacking four or five rifles and six or eight spears. Moreover, they were paralyzed, as in every other case in which I met such low people, by the sight of white men.

One village chief, after getting his people around my camp in such numbers as to worry my followers somewhat, but in wholly insufficient numbers to have made any successful trouble with my whole body, which consisted of eighteen well-armed men, finally came down in utmost submission and declared, as nearly as I could make out from the five interpreters arranged in tandem, that I was a god and could eat him up if I chose.

This middle territory will soon be assigned in part to Abyssinia and in part to the Sudan. That part assigned to the Sudanese authority, which means the British, will soon have some new life built out of the remains of a devastation as complete as anything imaginable. The Abyssinian portion will live along its barbaric fashion with some small development.

The status of the black and naked Shankali will be slightly raised, and at least the country will be so well ordered by the power of Abyssinian soldiers that further investigation by white men may in the future be easily carried on there.

But the Abyssinian himself is not, in my judgment, ready for civilization as we measure civilization, though the upper classes already have much of the manner of the polished eastern people without having the material richness that Asiatic civilizations have produced.

The Abyssinian is individually rather an independent, easy-living, battle-loving, raw-meat-eating, sensual, devil-may-care chap; but one must guard against giving any definition or description which shall be taken as universal in its application. This is rendered particularly inappropriate when one recalls the varying types from the well-chiseled Arab and Jewish down to the coarse negroid caused by all degrees of miscegenation.

Their laziness, their fondness for *back-sheesh*, their inaccuracy, and their pride, puffed up by the defeat of the Italians; their ignorance of what we know to be our immense superiority—all this for a time irritates the traveler, but in the end there is left rather a pleasant impression of kindness.

As is generally the case, the Abyssinians who have seen most of Europeans are not those whom Europeans would like most to see.

I should be quite willing to trade with bars of salt, which constitute the chief currency from Addis Abeba westward

northward, and southward, or with beads or with empty tin cans, all of which served my purpose in various places, rather than to have the convenience of using the Maria Theresa or the Menelek dollar, which coins are now quite readily taken along the caravan routes from Addis Abeba to the east.

Rather this inconvenience of crude methods, with the greater simplicity and straightforwardness of the untutored native, than the coarse cunning which begins to appear when the native begins to suspect and compete with the superiority of the white man and to truckle only to one thing, namely, *backsheesh*.

THE FUTURE OF ABYSSINIA.

Today Menelek and the Sultan of Morocco control the only two territories independent of actual occupation or diplomatic claim on the part of some European power. As between these powers, this division has been made without bloodshed, and is a notable triumph for diplomacy; and I believe that the European domination of African territories may be counted as blessed, for certainly those territories which have passed beyond the first paroxysms of savage resistance now show larger and more comfortable populations than existed under native rule and misrule. This is not set forth as an apology for the grasping of territories held by lower races, since our ethical standard is not well enough determined for application to these cases, and since, moreover, the grasping continues to take place, whether we count it as right or wrong.

The ultimate determination of the Abyssinian and Morocco territories will put a much more severe strain upon diplomacy than it has yet been called upon to bear in regard to African affairs. The population now in occupancy of the territory is in both cases far above the average of African intelligence, and in

one case community of religious form with European countries will tend to complicate the situation, in that the missionary cannot appear so opportunely as a *casus belli*. However, to overcome that difficulty, we may convince ourselves that the Christianity of the Abyssinians is not quite the correct style, and may thus approximate this case to others in which the itching palm is stretched forth as if in prayer.

Here again let me say that it is not my desire to criticise missionary methods. To me, believing, as I do, that the universe is absolutely law-ordered, even to the lifting of a finger, the blood-thirsty missionary appears to be as solemn and as necessary a part of the scheme of the universe as any other part.

Quite as convenient, perhaps even more so, than the missionary as a *casus belli* is the railway—that is, the railway of civilized man laid in barbarian country. Not only may it furnish the cause of war, but it, of course, immensely simplifies the problem of carrying out the war which it may have produced. While the French, together with the English, Italians, and Russians—the four nations which have sent emissaries to Menelek—are doubtless of the firm conviction that this is not the time for war-making, that the enlightened peace of Menelek serves best all purposes which can now be served, it remains that when disorders of any sort arise, if the railway may have then been completed up to the top of the Abyssinian plateau, the French will have obtained a very great advantage for the playing of such part as they may then choose.

An extension of the British-Egyptian Railway up the Nile, now stopping at Khartum, may be made without great difficulty along the route which I followed, and which I pointed out in a paper about to appear in the Journal of the Royal Geographical Society of London. Such extension would practically equate advantages in respect to transpor-

tation, if we consider only a contest between either France or England on the one side and Abyssinia on the other; but if these great Powers were themselves at war, then the naval supremacy of England, operating from a great fortified sub-base such as Aden, would probably control and paralyze the Jibuti terminal of the French railway.

But taxed as is Great Britain now, it does not seem probable that this 500-mile extension will be undertaken at a very early date. So far as the peace of the civilized world and the continued independence of the Abyssinian are concerned, it seems probable that a continuation of the state of unpreparedness on the part both of France and England should serve best these ends of peace. To subsequently maintain at about equal point of advantage the facility which either of these great nations might have for making war upon, with, or through the Abyssinians would prolong the national life of this interesting people, who occupy in barbaric style one of those splendid stretches of the earth's surface which must ever tempt the daring European, driven forth as he is by a blind racial instinct—driven forth to combat and to push away the specter that Malthus raised.

Could you have been with me in marching over the devastation marking the as yet unconquered Bollasa region into the Sudan, where only a few months before the blood of the dying calipha had cemented the foundations of peace; could you have seen there the small but happy beginnings of well-ordered villages and the contented submission of these black and wayward children of the

desert and their obedience to the firm, wise rule of the English officer, recalling the unchanging story of almost unending tribal war, you would feel very nearly convinced that, if indeed peace and order be good for the lowly developed peoples of the world, this good will be earliest attained by the sacrifice to some such great policing power as Great Britain of an independence which ever has meant native tyranny.

But we must remember also that disasters which read terror into our blood but furnish in part the needed excitement to give some value to the crustacean lives of these rude people.

Passing one day through the ruins of a village marked by broken pottery vessels and grinding-stones, my grinning guide explained that here he had lived some few years ago; the village had been attacked by Mahdists or slave-traders, he seemed scarcely to know or care which, and he had lost his hut, three wives, and one or two children, himself escaping into the close-pressing bush. "But," said he, with the philosophy which made me poor in his comparison, "I now have another hut, other wives, and other children," and he laughed good-naturedly. Absolutely the only care at that time in the mind of this simple savage was a desire to get loose from the caravan in order that he might return to the hulk of a hippopotamus which I had shot two days before. Could he but secure that black carcass for himself and his small village, life would have no other cares—today, tomorrow, and even next week would be provided for. Could more be asked of Heaven?

THE OLD YUMA TRAIL

BY W J MCGEE

SOME three to seven centuries before Columbus, the country lying south of Gila River, west of the Sierra Madre, and east of the Californian Gulf was occupied by an agricultural people, and the ruins of their villages, the remains of their irrigation works, and the crumbling fortifications of their places of refuge on adjacent hilltops—mute witnesses of the rise and passing of a people—still survive in numbers. The finely wrought fictile ware, shapely stone implements, and obsidian blades from the ruins betoken the culture commonly known as Aztec or Mexican, or better as Nahuatl. The location and extent of the house remains, as well as the traces of great acequias, betoken irrigation systems more extensive and successful than those of the Mexicans or Americans of today. The vestiges of temples and plazas combine with the symbolic decoration of the pottery to betoken a complex social organization resting on a religious basis, while the corrals (each with its water hole) in many of the villages, together with some of the pictographs carved on neighboring cliffs, suggest, if they do not attest, that a llama-like animal, the coyote, the turkey, and perhaps other creatures, were domesticated by the villagers. The entrenched refuges ("las trincheras" of the modern Mexicans) are among various indications that the peaceful, pastoral folk were displaced and nearly destroyed by a predatory foe whose ruthless energies were directed against irrigation works as well as against families, farms, and flocks, and the testimony of the ruins is supported by the traditions of surviving tribes, which point to the marauding Apache as the

spoilsman—and hence the hereditary enemy—of the plains people. During this early agricultural period the scant waters of the region were where they are now, and were probably little, if any, more abundant than today, though better conserved and distributed by means of repesos and low-gradient acequias. The village sites were those selected long after for aboriginal and Mexican pueblos, with a few others never again occupied, while the trails and roads, as they were by watering places and impassable sierras, must have followed lines corresponding with those of later travel. Among the natural routes fixed by water and mountain, and still marked by ruins and smaller relics, was that which long after became the Yuma trail.

THE TIME OF TRADITION.

The ancient lore and modern customs of the Papago Indians tell of descent from the prehistoric irrigators—tell that their tribal ancestors were among the few survivors of the prehistoric pastoral folk who, driven into the deserts too far for foes to follow, were able to adjust themselves to one of the hardest environments in America, to engage in a ceaseless chase for water singularly like the chase for quarry in lower culture, and to produce a unique combination of crop-growing industries with migratory habits.

One of the earliest havens of the ancestral exiles was a meager oasis already occupied by some of them, though divided from the customary Apache range by a hundred miles of waterless desert; here a tiny rivulet, fed by the subterranean seepage from rugged granite

ranges on north and south, trickles permanently over the sands of a broad wash occasionally swept by the freshets following storms in the same mountains; here the refugees began anew the development of tribal character; and here began their unwritten Book of Leviticus, following their Genesis and Exodus in curiously Hebraic order, in their Ancient Sacred Tales. Devotees (like other lowly folk) to the dark mysteries of unstudied nature, they had brought their old faith with them, but enshrined it anew in their second Eden; carrying a cult of the sea—a vestige of littoral life in earlier generations—in which they worshipped the ocean as the infinitely potent Mother of Waters, and finding their faith sharpened fearsomely by the incomparable preciousness of fluid in these outer deserts, they enjoined on their young men pilgrimages to the Gulf at its nearest point as sacramental requisites for entering into the stage and condition of full manhood; bringing seed of maize and beans from ancestral gardens, they not only planted but cherished their crops with a consuming watchfulness growing into actual worship, and finally giving name to both locality and tribe—for oasis and river came to be known as the Place of Corn (Sonoyta, as commonly written), and the tribe as Beans People (*papahoaatam*).^{*} The habit of eternal vigilance on the part of the Papago of defense or flight, according to the strength of invading parties, led to the placing of outposts as far east of Sonoyta and as near to the Apache range as might be; and eventually a semi-symbolic outpost was established at the most conspicuous and impressive landmark of all Papagueria—Baboquivari Peak. This station was supported partly by shamans armed with magical devices, partly by bold and athletic warriors who could be trusted to traverse the hundred miles of

desert to Sonoyta between noon-day suns; and there is traditional evidence that the granite walls of the peak—so lofty and precipitous that but one Caucasian^{*} has scaled them—were climbed and its crest occupied by at least one party of tribesmen. In time Baboquivari became the Sacred Mount of all the Papago; and as the tribe multiplied and flowed feebly back toward the ancestral valleys, the sacramental pilgrimage of the young men was so extended as to cover the 150 miles from Baboquivari to the sea, with Sonoyta as a way station.

A half of the path thus trodden by the Papago pilgrims from some centuries before Columbus up to the beginning of the twentieth century was that retrodden by Caucasians for a century and a third as the Yuma trail.

THE COMING OF THE CAUCASIAN.

The first foreigners to approach the ancient trail were Alvar Nuñez Cabeza de Vaca and his companions (in all, three whites and one black), as they near the end of the most remarkable transcontinental journey in the history of America, in the spring of 1536; three or four years later Coronado's army also approached and perhaps crossed within sight of Baboquivari, and it is practically certain that a detachment of this army actually followed the footsteps and guidance of the Papago pilgrims over a part of the trail. It was in September, 1540, that Captain Melchior Diaz set out from Coronado's headquarters at Corazones (at or near the site of the present Ures) with a force of 25 men in the hope of intercepting Alarçon's fleet on the coast, and so shaped his course as to strike Rio Colorado a little way above its mouth. His route was never mapped, nor even fully described (he lost his life through an accident in the Colorado country); but to one who has traversed the region

^{*} Cf. "Papagueria," *THE NATIONAL GEOGRAPHIC MAGAZINE*, vol. IX, 1898, p. 345.

^{*} Prof. R. H. Forbes, of the Territorial University of Arizona.

in several directions, sifted the local lore of waterpockets in the rocks and coyote-holes in the sandwashes, and traced the routes of both prehistoric and present travel, it seems clear that Diaz' detachment worked northwestward to the Horcacitas and on to Rio San Ignacio, and thence across the plains to Sonoyta, where he must have watered and rested before pushing forward by way of the high waterpockets (Tinajas Altas) to the great "River of Good Guidance" (Rio de Bono Guia, an early name of the Colorado); and it must have been by the same route that the leaderless party returned in January, 1541.

With this expedition the third chapter in the history of the Yuma trail ends abruptly; for, through the most astounding blunder of American geography, the memory of Diaz and the records of Alarcon and his predecessor, Ulloa, dropped out of mind for more than a century and a half, during which the Californias were mapped as a great island in the Pacific.

THE JESUITS AND THEIR SUCCESSORS.

Toward the close of the seventeenth century the era of Jesuit missionizing in Papagueria opened, and not long after Padre Kino and his colleagues struck the tribesmen's trail from Baboquivari to Sonoyta; and it was in 1701 that Kino pushed westward, necessarily by way of Tinajas Altas (which he was the first to map), and rediscovered Rio Colorado, thereby puncturing the bubble of fictitious geography.

The good padres were ideal pioneers; wherever the Indian trails led, there they followed; and wherever an Indian settlement was found, there they erected crosses and sought converts. To them the Place of Corn on the slender rivulet was a fertile field. Some fifteen miles down the sandwash from the principal village they found a smaller settlement gathered about a spring of whitish water seeping from potash-bearing granites,

for which they adopted the native name House-ring Spring* (Quitobac), and they set their wooden cross midway between the two settlements and called the place Santo Domingo.

As missionizing proceeded, routes of travel were opened from tribe-range to tribe-range; and in the course of a few decades the hard trail from Culiacan (or Ures, or Chihuahua, or Fronteras) to Santo Domingo, and thence to the Yuma country on the Colorado and on to the missions of California, became an established route of travel and communication. The palmiest days of the Yuma trail rose and set in the century 1740-1840. It was trodden by adventurers too poor to ride, yet too plucky to stay; it was beaten by hoofs bearing churchly equipage and royal commissions and vice-regal reports too precious to be entrusted to the crude craft then plying the Pacific; it was furrowed by the huge hewn-log wheels of Mexican carts carrying families a few miles a day, and later by the iron tires of prairie schooners and primitive stages; its borders were trampled by stock driven out to enrich the distant province of Alta California; and its course was marked by the pitiful mile-stones of solitary graves, each with its cruciform heap of pebbles. During this period the hard route was dubbed "El Camino del Diablo;" and it formed (alternatively with the easier but much

* The typical Papago house is of hemispherical shape and made of grass thatch attached to a framework of mesquite saplings and akatilla stems; it is called *ki* or *key*. The first stage in building is the erection of a first course of thatch in the form of a vertical ring 12 or 15 feet in diameter; this may be occupied for weeks or months before the upper courses are added to complete the walls and forming the roof; it is called *ki-to*. *Bac* is one of several Papago terms for water or watering place, and is applied specifically to springs. When the missionaries found a larger Papago settlement about a series of mineral springs 30 miles south of Sonoyta, also called Quitobac, they applied a Spanish diminutive to the first found village, and ever since it has been known as Quitobacquito.

longer route by way of Tubac and Tucson) the main overland tributary to "El Camino Real"—The Royal Highway of California.

The Jesuits were expelled in 1767; but the old Yuma trail and the old California missions remained as monuments to their enterprise and as means of later progress.

With the international friction presaging the Mexican war, the importance of the ancient trail began to wane; with the treaty of Guadalupe Hidalgo in 1848 our own argonauts cast their eyes toward the far-ruined overland route, and with the gold fever of Forty-nine the activity along the fitly named Camino del Diablo waxed again temporarily. The sharing of its miseries by American and Mexican adventurers begot sympathy and mutual understanding, and opened enduring friendships which helped to heal the international breach and obliterate the scars of warfare. Yet the transitional epoch was not without painful episodes; the Crabb filibustering expedition struck the historic trail on their way *via* Sonoyta, to be annihilated at Caborca (where the old church still bears bullet-marks of the battle); tradition tells of an immigrant colony from Mexico to California following the ancient way to Tinajas Altas, where they were halted by an evil conjunction of epidemic with international complications to fill literal scores of graves still dotting the barren footslopes of the dazzling sierra; and equally stirring events still live in the memories of all older Arizonians and Sonorenses.

It was during the gold-fever renaissance that the death-roll of El Camino del Diablo became most appalling, for many of the travelers were fresh from humid lands, knew naught of the deceptive mirage or the ever-hovering thirst-craze of the desert, and pressed out on the sand wastes without needful preparation. The roll will never be written in full, since most of the unfortunates left

no records, scores leaving no sign save bleaching bones; but observers estimate that there were 400 victims of thirst between Altar and Yuma within eight years, an estimate which so conservative a traveler as Captain Gaillard thought fair after he had "counted sixty-five graves in a single day's ride of a little over thirty miles."

THE BOUNDARY SURVEYS.

With the Gadsden purchase of 1853, the boundary surveys already under way received fresh impetus, while the belated argonauts still trying all possible paths toward the new territory, whose name was synonymous with gold for a generation, were once more tempted southward. So, even before the survey reports were published the fame of the route spread widely; stories of hard marches over the malpais stretching out from the volcano of Pinacate, of the miring of outfits in the bottomless mud of Tule valley in springtime, of wagons clogged in shifting sands, of desperate night marches under the sharp goads of thirst and hunger, of rescues of thirst-crazed waifs, of burials of the bodies and distributions of the goods of less fortunate parties—these and other heart-rending recitals were whispered afar, or penned in friendly letters, to color the lore of America's most energetic pioneering and filter meagerly (far too meagerly for full history) into literature. The ill-repute of the trail gradually diverted the overland travel to more northerly routes, and when the Southern Pacific Railway pushed over the arid zone in the seventies the old route was finally deserted, save by Papago pilgrims in the sacramental journeys still pursued, and by rare prospectors or hunters.

The final chapter in the history of the Yuma trail touches only the retraversing of the route (after sixteen years without the passage of a vehicle) by the International Boundary Commission of

1891-1896, and the erection of the most serviceable series of international boundary monuments on the western hemisphere—massive pillars of cast iron or solid pyramids of cement-laid stone—each so located that the next monument and the intervening country in either direction can be seen from its site, while the position of each is established with respect to neighboring natural features by published photographs. The boundary party was of men well known throughout both countries; the American commissioners, Colonel Barlow, Captain Gaillard, and Astronomer Mosman, like the naturalist, Dr. Mearns, were chosen on account of previous achievements, while the Mexican commissioners, Señores Blanco, Gama, and Puga, were equally eminent representatives of the sister republic. A report worthy to serve as a model for future commissions, accompanied by an ample atlas and a portfolio of photo-mechanically faithful portraits of the plains and mountains intersected by the boundary, has been published within a few months, while one of the clearest pictures of the arid region ever drawn is Captain Gaillard's "Perils and Wonders of a True Desert."*

The wheel ruts and mule tracks left by the party seven years ago are still plain along the trail, save where obliterated by sand-drifts; even the tent-pegs, ash-heaps, half rusted cans, and empty pickle bottles still attest the arduous work and

frugal fare of the commissioners and their collaborators; for one of the characteristics of the desert is the extreme sluggishness of surface-changing processes, a sluggishness hard to realize by those who dwell in humid lands.

After the passing of the boundary parties, the old trail remained untrodden from Quitobaquito westward, except by a road supervisor erecting guide-posts in the portion lying within Yuma County, and by three horsemen (an American, a Mexican, and an Indian) in other portions, until November, 1900, when it was struck by an expedition of the Bureau of American Ethnology.

Such, in brief, is the history of one of the most striking and picturesque routes of travel on the continent. Trodden first in a prehistoric period known only through crumbling ruins, then followed for half a millennium or more in votive journeys of Papago tribesmen—the Bedouin of America—it was traced by Spaniards long before the landings on James' island and on Plymouth Rock. Adopted by evangelists two centuries ago, it soon became a line of pioneering, a highway of colonization, an artery of royal communication; next it was thronged by the indomitable army of argonauts on their way to open a new world on the shores of the Pacific, and later it lapsed into utter desert, than which there is none more forbidding in America.

*The Cosmopolitan, October, 1896, pp. 592-605.

To be concluded in the April number.

THE SEA FOGS OF SAN FRANCISCO*

FROM May to September little rain falls in San Francisco, but every afternoon great banks of fog march in from the Pacific and envelop the houses, streets, and hills in their dense folds. Ocean fogs as a rule form when cool air flows over warm moist surfaces; but in the case of the San Francisco sea fogs these conditions are reversed, for the ocean surface temperature is 55° Fahrenheit, while the air temperature may reach 80°. Another explanation, therefore, of the cause of these fogs must be sought.

A glance at the map (not reproduced) shows how ocean, bay, mountain, and foothills are crowded together. East of San Francisco stretches a valley 450 miles long and 50 miles wide and level as a table. In this valley the afternoon temperature in summer is usually 100° or over. The valley is connected by a narrow water passage, the Golden Gate, with the Pacific Ocean, the mean temperature of whose waters is in this locality about 55°. Thus within a distance of 50 miles in a horizontal direction there is frequently a difference of 50 degrees in temperature. At the same time in a vertical direction there is often a difference of 30 degrees in an elevation of half a mile. Well-marked air currents, drafts, and counter-drafts are therefore prevalent.

The prevailing surface air currents at this season of the year are strong westerly currents, but high bluffs, ridges, and headlands intercept these winds at such an angle that they are diverted to and pour through the Golden Gate with greatly increased velocity. The result is that both air and water vapor are piled up at this point. Mr. McAdie therefore

concludes that the summer afternoon fogs of the San Francisco Bay region are probably due to mixture, rather than to radiation or expansion. They are the result of sharp temperature contrasts at the boundaries of air currents having different temperatures, humidities, and velocities. In originating and directing these air currents the peculiar contours of the land also play an important part.

The fog outside the Heads may extend over an area 10 miles square and reaches to a height of about half a mile. If it were solidly packed its bulk would thus be 50 cubic miles. As a cubic foot of the fog at its average dew-point temperature, 51° F., weighs 4.222 grains, a fair estimate of its total weight, allowing for wide swaths or channels fog free, is 1,000,000 tons. This immense volume is carried through the Golden Gate by westerly winds blowing 22 miles an hour, from 1 to 5 p. m. on summer afternoons.

The United States Weather Bureau maintains a station on Mt. Tamalpais, which is about half a mile above sea-level and thus above the fog, another in the city of San Francisco, where the fog converges, and a third station at Point Reyes, the center of origin of the fog. Mt. Tamalpais is about 25 miles from Point Reyes and 10 miles from San Francisco.

The differences in the temperature and humidity of these three stations is most marked. The highest temperature recorded on the mountain during the year 1899 was 96°, on July 18; the maximum temperature on the same day at San Francisco was 66°, and at Point Reyes 52°. That is, on the mountain it was 30 degrees hotter than in the city and 44 degrees hotter than at Point Reyes. The mean annual temperature of the three stations is, however, about the same for all, 55°, which is also the

*An abstract of a paper contributed to the *Monthly Weather Review* for November, 1900, by Alexander G. McAdie, forecast official of the U. S. Weather Bureau at San Francisco.

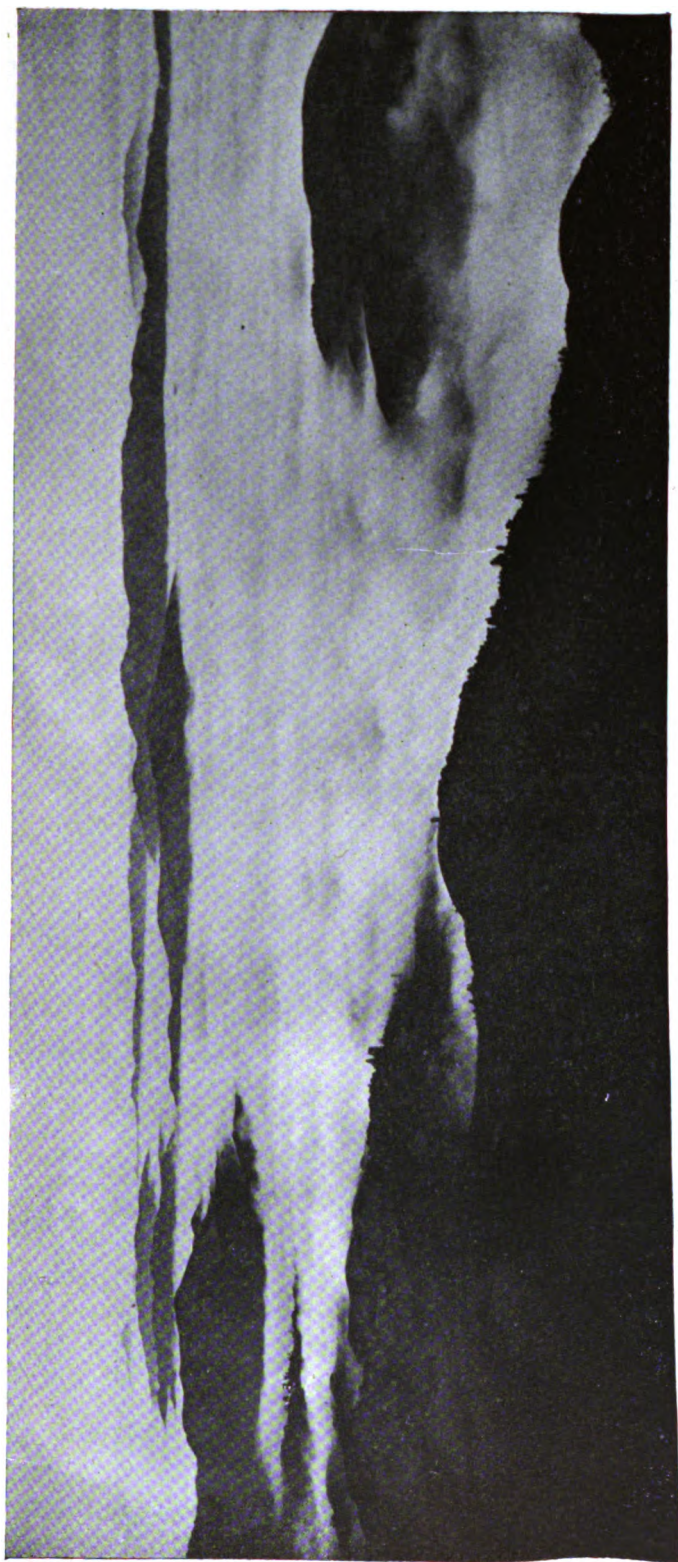


Figure 1.—Morning Fog over Valleys.
View from U. S. Weather Bureau Observatory, Mount Tamalpais.

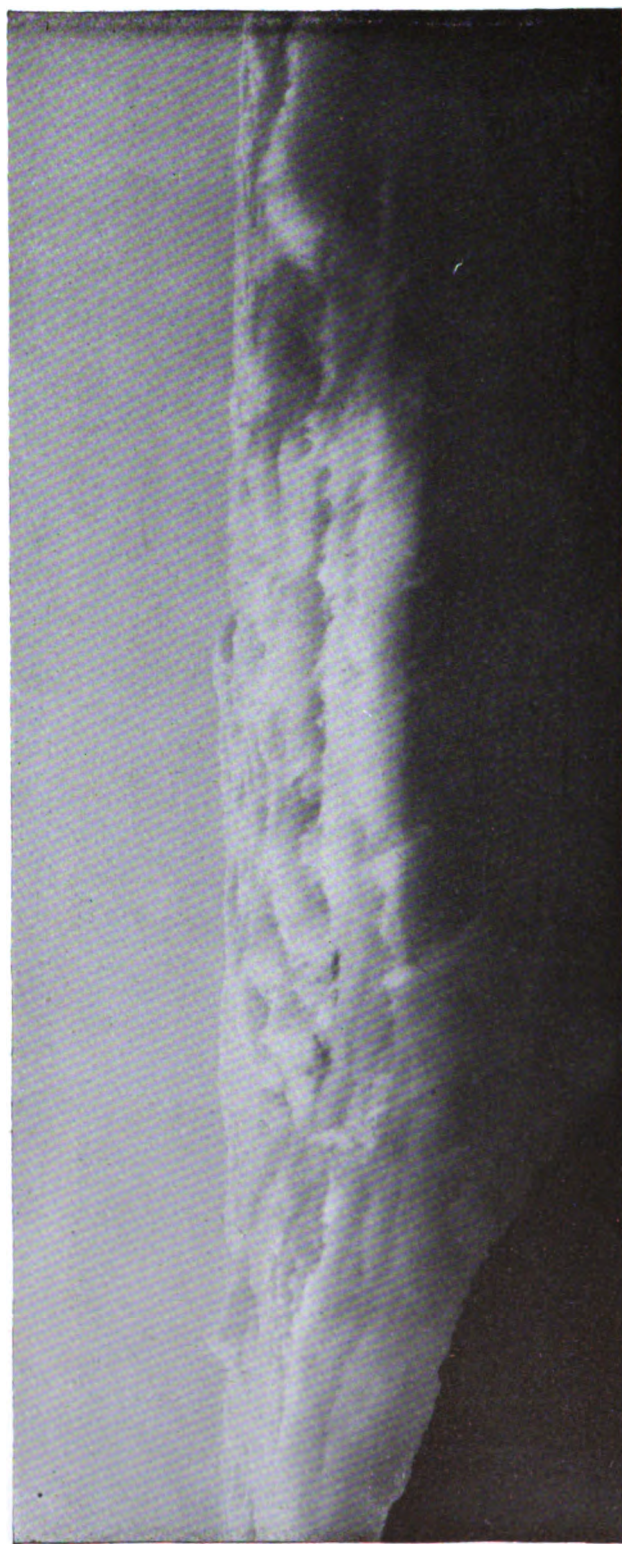


Figure 2.—Lifted Fog. Height above ground about 500 meters.
View from U. S. Weather Bureau Observatory, Mount Tamalpais.

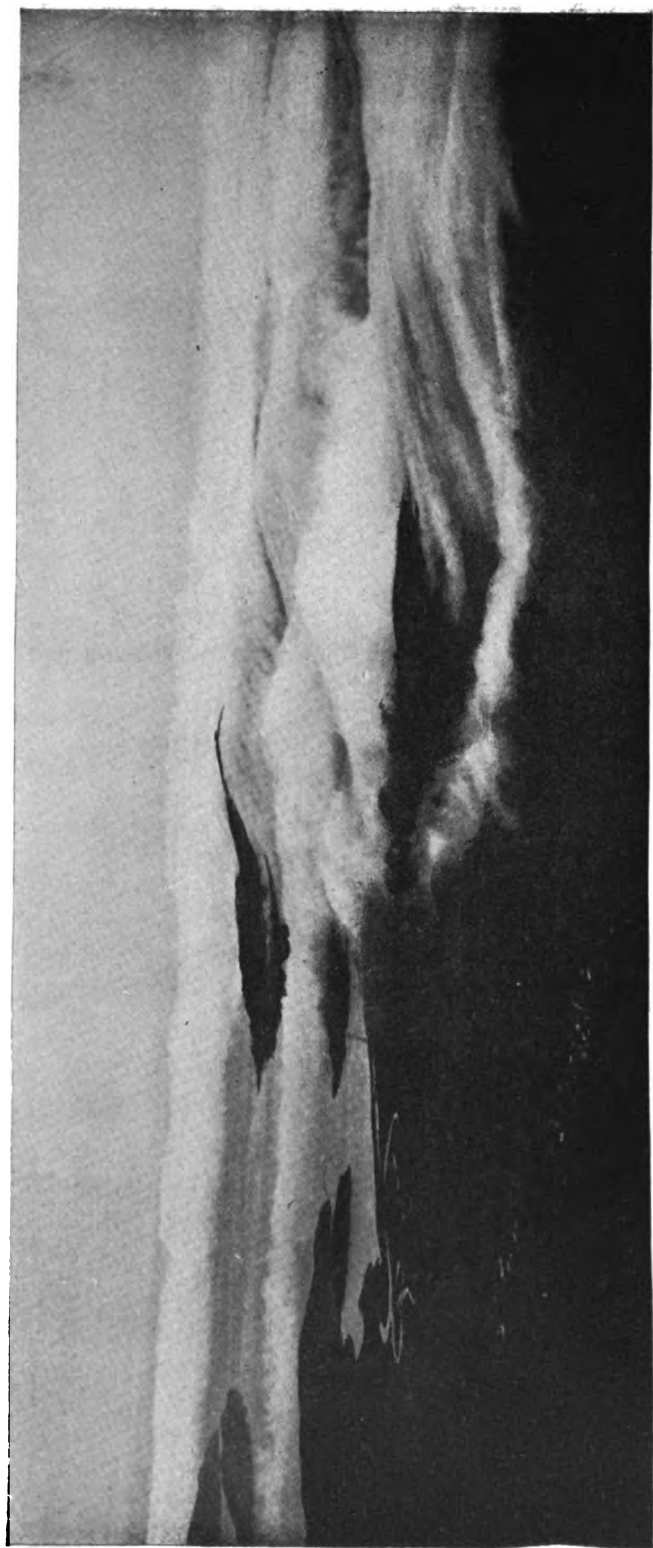


Figure 3.—Summer Sea Fog pouring over Sausalito Hills and through Golden Gate.

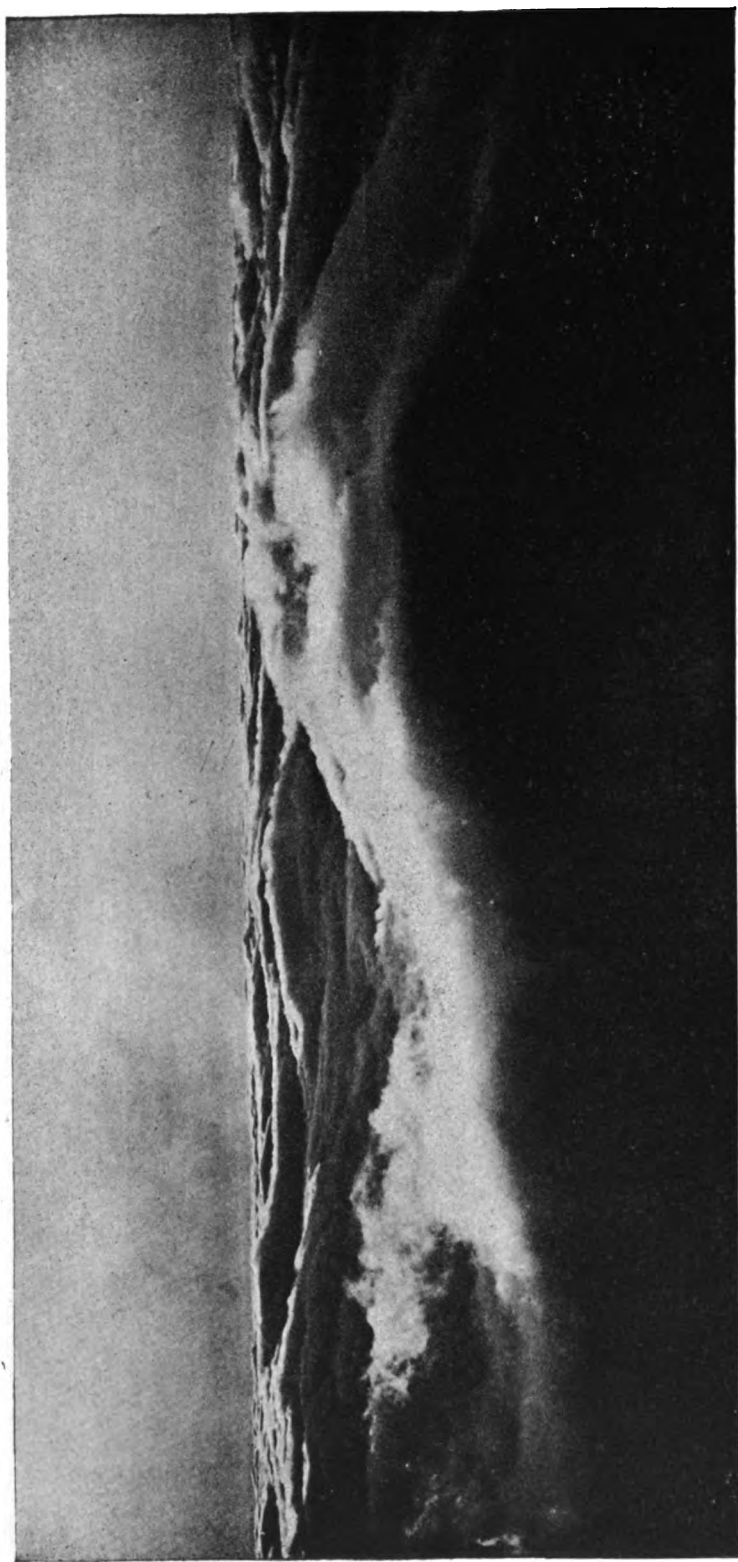


Figure 4.—Fog Waves.

View from U. S. Weather Bureau Observatory, Mount Tamalpais.

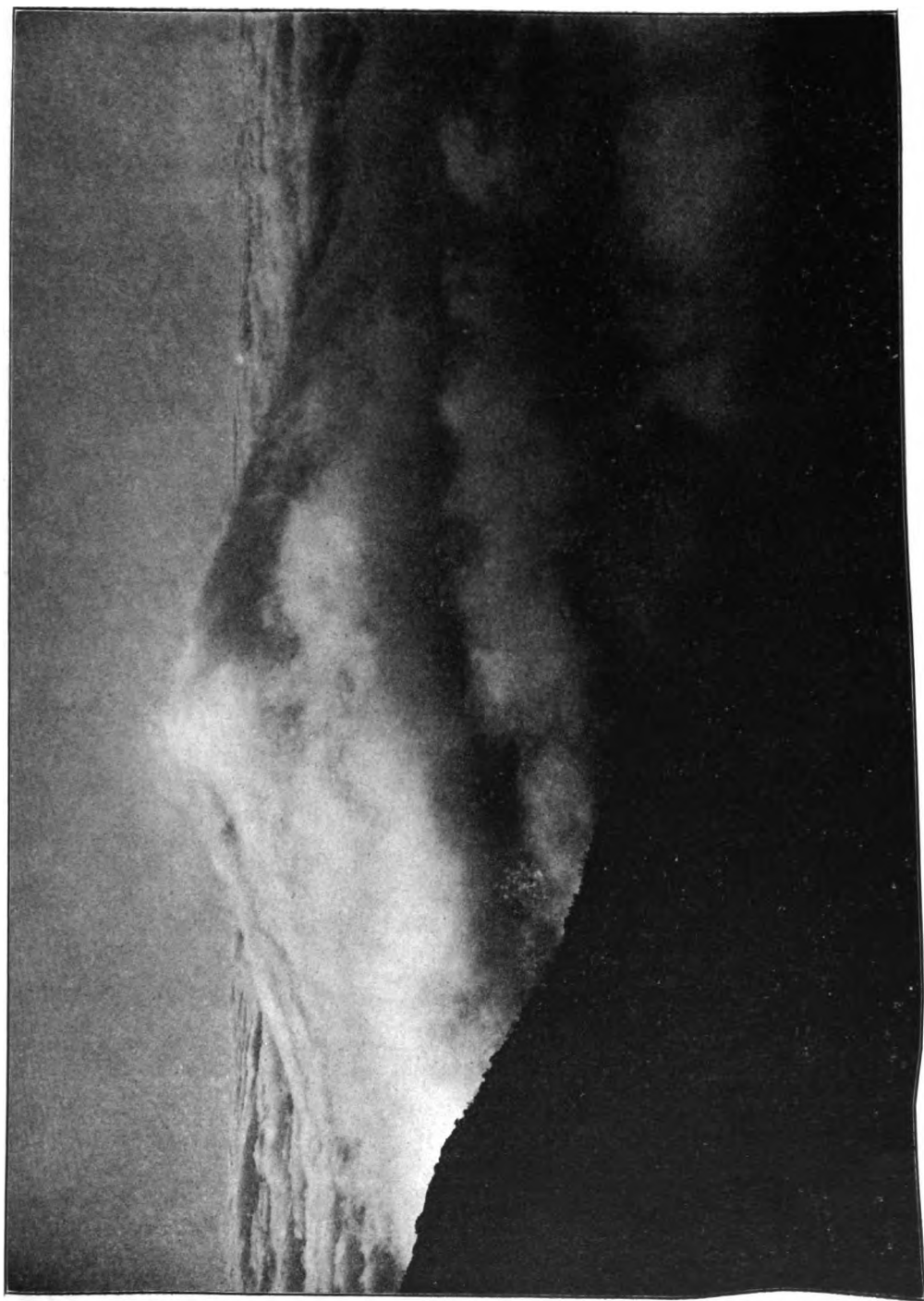


Figure 5.—Fog Billow.
View from U. S. Weather Bureau Observatory, Mount Tamalpais.

mean annual temperature of the ocean in the vicinity of the city. During the summer months, owing to the fog, there is usually a cooling of at least 11 degrees at the lower stations; but in winter naturally these conditions are reversed, the temperature near the sea remaining higher than on the mountain. The mean relative humidity at the station on Mt. Tamalpais was 59 per cent, while that at San Francisco was as high as 83 per cent. The average hourly wind velocity for the higher station is also much greater than that of the lower station, the maximum velocities recorded being respectively 91 and 47, and about this proportion is maintained throughout the year.

The Weather Bureau officials in the city receive frequent reports from Point Reyes and Mt. Tamalpais, and thus are able to issue a daily chart showing the extent and character of the sea fog over Drakes Bay, the roadstead, and the Golden Gate.

From Mt. Tamalpais Mr. McAdie has made a special study of fog conditions. His method of obtaining a cross-section of the fog is very ingenious. A descent from the station to sea-level can be made by the train in about fifty minutes, a distance of eight miles. A kite meteoro-

graph is attached near the top of an open-canopied car, insuring good circulation, and carried through the fog in this way a number of times. From the data thus obtained, a rough cross-section is made. A typical pressure distribution accompanying sea fogs has been recognized. In general, a movement southward along the coast of an area of high pressure in summer means fresh northerly winds and high temperatures in the interior of the State, with brisk westerly winds laden with fog on the coast.

The illustrations that accompany this paper depict very graphically the splendor of fog effects. Figure 1 shows the morning fog covering the valleys—the most common type of fog. Figure 2 shows a mass of lifted sea fog in a state of comparative rest. Figure 3 shows the summer sea fog pouring in a mighty torrent through the Golden Gate and submerging the neighboring hills. Figures 4 and 5 show the great billows of the wind-driven sea of fog.

To Prof. Cleveland Abbe, editor of the *Monthly Weather Review*, and to Mr. Alexander G. McAdie, of San Francisco, the NATIONAL GEOGRAPHIC MAGAZINE is indebted for the photographs.

GEOGRAPHIC FACTS FROM REPORT OF THE TAFT PHILIPPINE COMMISSION

THE total amount of land in the Philippine Islands is approximately 73,345,415 acres. Of this amount it is estimated that about 4,940,000 acres are owned by individuals, leaving in public lands 68,405,415 acres.* The land has not been surveyed, and these are merely estimates. Of the

public lands, there is about twice or three times as much forest land as there is waste land. The land is most fertile and for the greater part naturally irrigated. There was a very great demand for this land, but owing to the irregularities, frauds, and delays in the Spanish system, the natives generally abandoned efforts to secure a good title, and contented themselves with remaining

* The religious orders own about 400,000 acres.

on the land as simple squatters, subject to eviction by the State. In 1894 the Minister for the Colonies reported to the Queen of Spain that there were about 200,000 squatters on the public lands, but it is thought by employees in the forestry bureau, who have been in a position to know, that there are fully double that number. In the various islands of the archipelago the proportion of private land to public land is about as stated above, except in Mindanao, Mindoro, and Palawan, where the proportion of public land is far greater.

The insufficient character of the public-land system under the Spanish Government in these islands makes it unnecessary to refer in detail to what that system was. As there were no surveys of any importance whatever, the first thing to be done in establishing a public-land system is to have the public lands accurately surveyed. This is a work of years, but it is thought that a system of the laws of public lands can be inaugurated without waiting until the survey is completed. Large amounts of American capital are only awaiting the opportunity to invest in the rich agricultural field which may here be developed. In view of the decision that the military government has no power to part with the public land belonging to the United States, and that that power rests alone in Congress, it becomes very essential, to assist the development of these islands and their prosperity, that Congressional authority be vested in the government of the islands to adopt a proper public-land system, and to sell the land upon proper terms.

MINERAL WEALTH AND THE MINING INDUSTRY.

It is difficult at the present time to make any accurate general statement as regards the mineral resources of the Philippine Islands. There has never

been any mining, properly so called, in this archipelago up to the present time. The mining fields have never been thoroughly prospected, and even where very valuable deposits were known to exist they were worked, if at all, in a haphazard and intermittent fashion.

Present indications are that the near future will bring a great change in the mining industry. According to the chief of the mining bureau there are now some twelve hundred prospectors and practical miners scattered through the different islands of the archipelago. Of these probably 90 per cent are Americans. They are for the most part men of good character. They are pushing their way into the more inaccessible regions, furnishing their own protection, and doing prospecting of a sort and to an extent never before paralleled in the history of the Philippine Islands. The result is that our knowledge of the mineral resources of the group is rapidly increasing. When all due allowance is made for prospectors' exaggerations, it is not too much to say that the work thus far done has demonstrated the existence of many valuable mineral fields. The provinces of Benguet, Lepanto, and Bontoc in particular form a district of very great richness.

In the province of Lepanto, at Manocayan and Suyoc, there are immense deposits of gray copper and copper sulphide, and running through this ore are veins of gold-bearing quartz, which is more or less disintegrated and in places is extremely rich. This copper ore has been assayed, and the claim is made that it runs on the average 8 per cent copper, while gold is often present in considerable quantities. The deposits are so extensive as to seem almost inexhaustible.

The Commission has been unable to verify the statements as to the extent and richness of these copper deposits through its own agents, but the authority for them is such that they are believed to be substantially correct.

As early as 1856-'57 two concessions were granted to the Cantabro Philippine Mining Company, and an attempt was made to exploit them and market their product. Rude methods of mining, ruder methods of extracting the metal, and still more rude and primitive methods of transportation, combined with lack of sufficient capital and suitable labor, led to the abandonment of this attempt, and for more than twenty years the property, which in itself is a small claim upon the immense ledge above referred to, has been occupied only to the limited extent required by the Spanish mining laws to prevent the cancellation of the concession. The officer at present in charge of the mining bureau characterizes this deposit as an "undoubted bonanza." The main thing necessary for its exploitation is the opening up of a short line of communication with the coast.

Lignites are known to exist in Luzon, Bataan (the island, not the province), Mindoro, Masbate, Negros, Cebú, Mindanao, and other islands. Some of the deposits are very extensive. As yet they have been worked only at or near the surface.

Testimony is unanimous to the fact that the Philippine coals do not clinker, nor do they soil the boiler tubes to any such extent as do Japanese and Australian coals.

The extensive fields near Bulacacao, in southern Mindoro, are within four to six miles of a harbor which gives safe anchorage throughout the year and which has water deep enough for the largest ocean-going vessels. Some of the Cebú deposits are also conveniently situated with reference to harbor facilities. It is to be confidently expected that the coal will play a very important part in the future development of the archipelago.

The outlook as to gold mines grows more favorable as the operations of prospectors are extended. Modern gold-

mining machinery has never been used in the Philippines. Igorrote miners in the Benguet-Lepanto-Bontoc district discard all rock in which there is not visible a considerable quantity of free gold. Prospectors in this region claim to have located very extensive deposits of low-grade, free-milling ore, which will yield large and certain returns as soon as concessions can be secured and machinery put in place. Unless the statements of those who have been working in this region are utterly false, it is true that very valuable deposits have been located, and that extensive operations will be undertaken as soon as claims can be granted and machinery placed. At all events, it is certain that the men who have located these deposits have sufficient faith in them to camp on them and wait month after month for the time to come when they can establish their claims.

Extensive deposits of high-grade iron ore are known to exist, but it would seem that their development must be preceded by the development of the coal fields.

But before any of the mineral resources of the islands can be developed mining laws must be enacted and existing claims settled.

HARBORS AND HIGHWAYS.

As may have been expected, centers of population and comparative wealth are to be found at the seaports and territories contiguous thereto, which are more or less accessible to markets by means of water communication; but these favored localities are limited in area and their facilities for doing business are, with few exceptions, inadequate and unsatisfactory.

Although there are numerous harbors dotting the coast line, there are but few that admit vessels of heavy draft. As a rule, they are not landlocked, and are more or less exposed to the pre-

vailing typhoons, so that there are frequently days, and even weeks during which ships can neither load nor unload.

Large vessels entering the harbor of Manila, having a draft of more than 16 feet, are now compelled to lie two miles or more offshore. Those of less draft than this find entrance into the Pasig River. The bay is so large that it feels the full effects of the winds. The only method by which large vessels anchoring therein can take on or discharge cargo is by lightering. At best, and when the bay is calm, this is a tedious and very expensive process, and during rough weather becomes impossible. Moreover, during the prevalence of typhoons, which are not infrequent, the safety of vessels thus situated is much endangered.

The cost of doing business in this port is very great and constitutes a very heavy burden upon commerce. Freight rates from Manila to Hongkong, a distance of about 700 miles only, are as much and sometimes more than from San Francisco to Hongkong, a distance of about 8,000 miles.

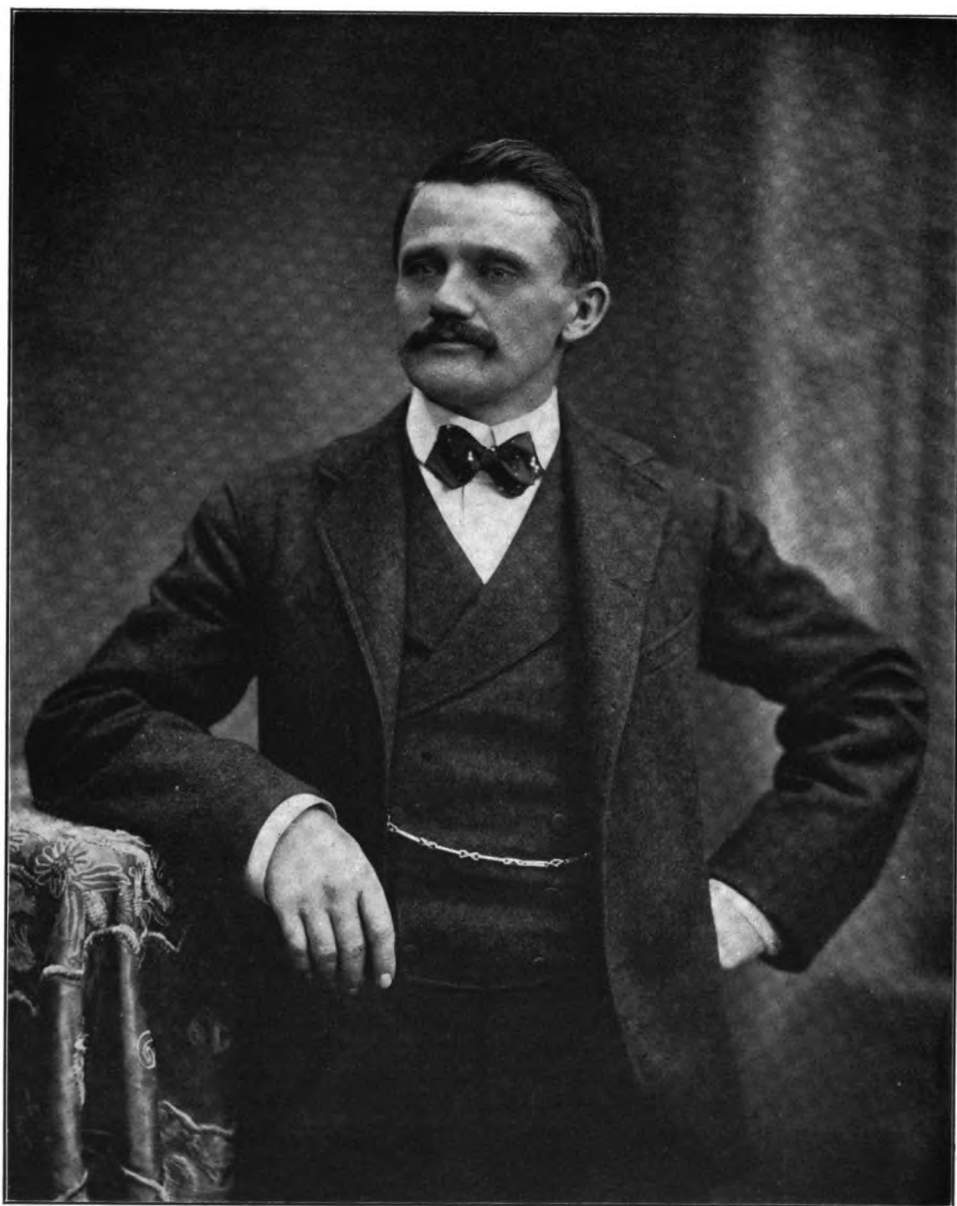
The Spanish Government, more than twenty years ago, formulated an elaborate scheme for the construction of a thoroughly protected harbor, with sufficient depth of water to accommodate the largest ships, and levied a special tax on imports and exports for the purpose of raising the necessary funds to carry it into effect. Operations were begun pursuant thereto shortly thereafter and continued in a slow and intermittent way up to the time of the native outbreak of 1896, with the result that about 30 per cent of the work contemplated was completed. Work upon these plans, with slight modifications, has been resumed by the Commission, which has appropriated \$1,000,000 for the purpose.

There are no navigable rivers, roads, or even permanent trails in the islands.

There are numerous water-courses in the great islands of Luzon and Mindanao which have their sources in the mountains of the interior and flow to the sea in rapid and broken currents. As a general rule, they are inconsiderable in volume and are either not navigable at all or, if navigable, only for a few miles from their mouths, so that they may be eliminated in considering the question of transportation.

The so-called highways are generally merely rude trails, which in the rainy season, lasting half the year, are simply impassable, and during the dry season are rough and only available for travel to a very limited extent. As a result, there are few natives of the interior who have ever been beyond the boundaries of towns in which they live. The Commission has appropriated \$1,000,000 to be expended at once in road-building.

The Manila and Dagupan Railroad is at this time the only line in the entire island. It was constructed by English capitalists and has been in operation since 1892. It has a gauge of 3 feet and 6 inches and traverses a rather low-lying, fertile region, densely populated. It was perhaps improperly located in the beginning, and crossing, as it does, quite a number of streams near their mouths, which necessitated much trestle and bridge work, was expensive to construct. This expense, it seems, was increased by unnecessary requirements of the Spanish Government. As a result, it appears to have cost the company about \$60,000 in gold per mile. It is an expensive line to maintain by reason of the fact that several of the streams, in seasons of flood, overflow their banks and inflict much damage upon the road-bed. But, whilst it has not earned a fair interest on the extravagant sum which it cost, it has been wonderfully beneficial in increasing the population and wealth of the provinces through which it runs and affords a striking illustration of the enormous benefits which



Evelyn B. Baldwin,
Leader of the Baldwin-Ziegler North Polar Expedition.

would accrue were railroads built in other sections of these islands.

A line has been projected from Manila eastward and southeastward, running along the shores of Laguna de Bay across the island to a port on Lamun Bay. This port is said to be the best in the islands, landlocked, affording

shelter in any weather, and with a depth sufficient to enable vessels of heavy draft to approach close to shore. With this line built, the distance from Manila to the United States would be shortened by about 700 miles. The line would pass through a number of large towns and a rich and fertile country.

THE PHILIPPINE EXHIBIT AT THE PAN-AMERICAN EXPOSITION

BY D. O. NOBLE HOFFMANN

WHEN the Pan-American Commission first considered the idea of a Philippine exhibit at the Buffalo Exposition, they were anxious to have on the grounds a typical Filipino village inhabited by genuine natives—men, women, and children. After much conference with the Government at Washington, it was shown that the cost of such an enterprise would be between \$150,000 and \$175,000, a sum greatly in excess of what would have been necessary in more peaceful times. Accordingly, the plan was declared not feasible. However, the Commission was anxious to have an exhibit of some kind, and declared the sentiment of the people demanded it. Further efforts resulted in the sum of \$10,000 being appropriated for the purpose. It was decided that such a sum could only procure purely ethnological specimens, necessitating the barring out of natural history and other subjects. The exhibit thus was made to include what the people of the Philippine Islands make with their own hands or obtain by purchase or exchange.

The management of the money appropriated was placed in the hands of

the Smithsonian Institution, which dispatched the late Col. F. F. Hilder to the Philippines to collect the exhibit. His long residence in the Philippine Islands, together with his acquaintance with many of the tribes and their dialects, and his knowledge of the conditions existing in the islands, coupled with his scientific training, served to fit him in a superior degree for this work.

Colonel Hilder certainly did remarkably well under the circumstances, and gathered an amount of valuable material of great interest and importance to the people of the United States. He collected upward of one thousand pieces, illustrating every phase of native life. Every condition and station, every age and sex, every occupation, pastime, and means of warfare, has a place in the collection.

Apparently hats, swords, and canes are the objects upon which the Filipinos bestow the most pride, for there are enough pieces of head-gear of various makes to fill a hatter's shop; enough swords, plain or fancifully carved, to arm a regulation-sized company, and enough canes to stock the stands of a country-fair mountebank.

The swords are of different shapes. They are all sharpened to the nicety of a razor. The bolo is the prevailing weapon. It is very short, for according to an old edict of the Spanish regime the blade could only extend from the wrist to the elbow in length. It is enough to give one an inspiration of fear. It is used also in cutting sugarcane, etc. The case is of wood and very often merely bound with twine, so that the wielder can strike through if he has not the time to unsheath the sword. The common bolo has a blade of steel, a wooden handle and an iron ferrule, though some have handles of silver and are far richer in appearance and design. One very formidable and beautiful weapon is the Kriss sword. This has a wavy-shaped blade of steel, the handle being of wood wound with native twine.

Passing to articles of more practical use, one of the first to attract attention is the "Luzon," a mortar used by the Tagals as a receptacle in which to loosen the husk from rice grain by pounding with a wooden pestle. It was the universal use of this article that caused the Spaniards to give the island of Luzon its name.

Then there are looms and other native contrivances, showing the manner of making their different cloths—*husi*, *jusi*, *pina*, *cinamay*, etc. These cloths are found in many beautiful colors—pink, violet, orange, yellow, blue, and black—and some are richly embroidered. Every article of domestic use is to be seen—laundry tubs and boards, scrubbing brushes made of half of a cocoanut in the husk, and brooms made of rice straw, and that necessary household article, the back-scratcher, formed of a small piece of cocoanut shell with serrated edge, laced with cotton thread to a long bamboo handle. Very suggestive of the popular song of the day are some samples of *goo-goo* soap bark. This bark is especially adapted for washing the hair,

leaving it soft and glossy, and produces thick suds the same as soap. Extreme care must be taken not to let it get into the eyes.

The native hearth is merely a rectangular frame of wood raised on four uprights of squared bamboo; the bottom is formed by a mat of woven splints of bamboo, the whole forming a box-like construction in which has been laid a quantity of hardened earth composition, on which the fire is built. Pieces of this substance in the shape of small elongated cones serve for supporting pots. At the back of the hearth and fastened to the two rear uprights is a piece of bamboo with two long slots and two holes cut entirely through, in which spoons and other utensils are placed when not in use. The three cooking pots with this exhibit are of red earthenware and unique in design. The spoons are each made of cocoanut shell laced to a handle by strips of rattan.

Making the fire on cold mornings is the unpleasant lot of many Americans. However, they ought not to grumble after they have seen the set of fire-making instruments used by the Filipinos and have had explained to them the laborious task of merely making a light. A piece of bamboo with a slit through the middle is placed on any convenient spot, with some bamboo shavings beneath. Another piece of bamboo is then rubbed through the slit at right angles until the shavings smoke, when the shavings are fanned into a flame.

A model of a native cocoanut-oil factory forms one of the most interesting exhibits of the industrial section. The operator sits on a cross-beam and with his feet revolves, by means of two pedals, a little metal shredder, which cuts up the cocoanut. The meat of the cocoanut then moves to a second worker, who crushes it by means of a roller which he rolls back and forth with one hand. The meat thus crushed enters a

press, which not only presses out the milk and oil, but also keeps back the fiber of the shell. When the boat-like receptacle underneath the press is filled with the oil, milk, and water, it is drawn to a fire, where the contents are heated in cauldrons until the oil rises to the surface and is scooped off.

The farmers of the Philippines have their peaceful occupations well represented. One will find at the fair all their agricultural implements and their clumsy, heavy plows and wagons. Their plows are for the most part made entirely of wood, with the exception of the share, which is of iron. The harrow is formed of a number of pieces of bamboo held together by three transverse rods passing through the pieces of bamboo. The teeth are formed of stubs of branches, with cords and yoke attached for one caribou.

The caribou is used in all their farm work and must be quite a tractable animal. The prudent prospective immigrant to the Philippines may gain a suggestion from a caribou sled which is used in muddy weather along the slimy roads and in the rice swamps. This is very unique and will attract much attention and create comment on the weather conditions prevailing in the Island of Luzon.

The Filipino rice reaper is made with a handle of wood in the shape of a hook and a blade of steel fastened on the under side of the grip. In using this implement it is held in the right hand and the hook gathers in the rice while the knife cuts it in one operation.

Farmers will smile when they see a farmer's costume such as is worn by the agricultural class among the Tagals of Luzon. It consists of a shirt of *husi* cloth, a pair of trousers, and a piece of cloth used for carrying articles over the shoulder or on the back.

That nature still supplies the wants of the Filipinos to a great extent is shown by a supply of fishing tackle,

nets, seines, shrimp and crab traps. Their fishing boats are called *bancas*. One of the most interesting things in the fishing line is a seashell from Tondo, a fishing point in the suburbs of Manila. The apex of this shell is sawn off to form a mouth-piece, and is used by the fishermen to call assistance when large schools of fish are found.

In the collection there is a milk vender's outfit, such as is used in the cities of the Philippines. The outfit consists of a black earthenware jar hung in a network of rattan partly covered with leather, a wooden shoulder yoke for carrying the jar, a pitcher formed from one section of a large bamboo, with a wooden handle attached by wire, and a measure also formed from a section of bamboo, branded with the inspection and license number of the vender.

Other trades are represented by appropriate exhibits, as the soldering pan and irons and tools of native tinsmiths. The pans are made of heavy earthenware. There is a set of native carpenter's tools; also a native harness-maker's outfit, with samples of tanned leather, a set of blacksmith's tools, and a set of mason's tools.

The amusements and forms of recreation of the Filipinos also have a place in the collection. They are evidently a musically inclined people, judging from the gay costumes of a native band of musicians with their instruments—mandolin, flute, guitar, violin, and 'cello. In the musical collection are a beautiful harp made of two kinds of *narras* wood and ebony, and an instrument supposed to be a horn, made from four sections of bamboo, each open at one end and closed at the other. The sections are inserted into one another at right angles and the joints made air-tight with a native gum, the last section being fastened to the main tube by rattan. The horn is held horizontally and played in the same manner as a cornet.

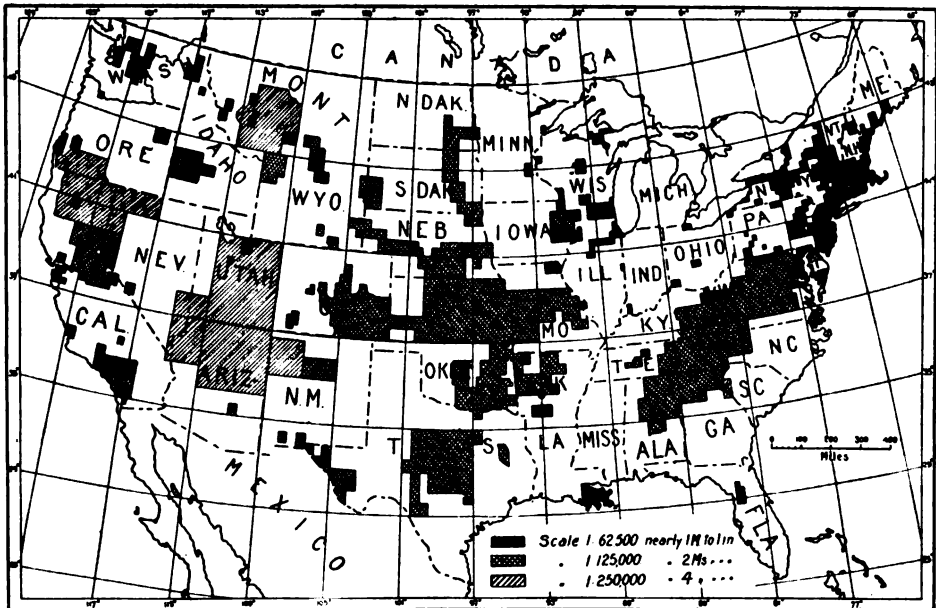
The Filipinos have many forms of amusements, but the greatest of them all is cock-fighting. There is in the Hilder collection a cock-fighter's box, containing four steel gaffs to fasten on the fighting cock's spurs and four leashes to restrict them when not actively engaged. *Pompa cabeza*, a puzzle game, is shown. Natives in nearly every part of Luzon play this game, which is attended with much betting. Roulette wheels and other games of chance are much in vogue throughout the islands, as the collection shows.

Foot ball must be a popular game in the islands, judging by a ball which the Filipino tosses and kicks about. It is somewhat different from our regulation foot ball, being made of a number of

strips or splints of rattan tied in the form of a "Turk's head" knot.

Forcible illustrations of Filipino warfare are fifteen cylindrical canisters of native Filipino manufacture, formed of sheets of tin nailed around two circular pieces of wood; they are filled with scraps of iron and fired by insurgents from smooth-bore guns at very short range; and a bamboo cannon bound with wire, captured by United States troops, at Balange Bataan, on January 5, 1900.

The exhibit comprises much more than can be covered in a brief article. It will prove profitable in giving information as to commercial interests, besides giving new ideas and opinions concerning the Philippines and their people.



GEOGRAPHIC NOTES

TOPOGRAPHIC MAPPING OF THE UNITED STATES.

NEARLY 900,000 square miles, or about 30 per cent, of the area of the United States have been mapped by the experts of the U. S. Geological Survey during the past twenty years. New England, the middle Atlantic States, and small sections of Wisconsin, Iowa, Louisiana, and California have been mapped on the scale of one mile to one inch and their elevations and surface relief expressed by contour lines located at intervals of 5 to 20 feet vertically. Maps of large sections of Kansas, Missouri, Texas, and Virginia have been made on the scale of two miles to an inch and with contour lines indicating vertical intervals of 20 to 100 feet.

Mr. H. M. Wilson, of the Geological Survey, contributes to a recent number of *The Engineering News* an interesting statement of this branch of work of the survey and explains its great practical value. As an example he mentions the case of the city of Waterbury, Conn., which, after spending \$10,000 in fruitlessly searching for sources of water supply, learned on consulting the Government topographic maps of a source of good water previously unsuspected. The survey expends nearly \$350,000 annually in making these maps. Many States also appropriate large sums to assist the work of the survey in their particular areas. New York, Pennsylvania, Maine, Alabama, and Maryland annually appropriate \$75,000 to hurry the completion of the mapping of their territory. The expense of mapping naturally depends upon the character of the country. The cost of mapping an open country is from five to ten dollars a square mile; that of mountainous or forest areas about double or triple that amount.

The results of these surveys are published on sheets approximately $16\frac{1}{2}$ by 20 inches and represent quadrilaterals of 15' or 30' of latitude and longitude, according as the scale is one or two miles to the inch.

The atlas sheets can be procured at purely nominal prices on application to the Director of the Geological Survey.

THE GERMAN CENSUS.

THE figures of the last census of Germany reveal some very significant facts relative to the great industrial and agricultural contest that is now being waged in the Empire. The census was taken on December 1, 1900. The growth of the cities, the industrial centers, during the preceding five years has been unprecedented in the history of the Empire. Of the thirty-three cities with a population of over 100,000, every one but Crefeld shows a great increase. Crefeld has decreased by 350, owing probably to the high tariff in the United States on silk goods, which has caused Americans to import only foreign silks of the highest grade. As a result, many hundreds of persons in Crefeld who were formerly employed in the silk factories were thrown out of work. Crefeld manufacturers have now begun to turn their attention to the making of cotton and woolen goods, and it is hoped that the next census will show an increase, not a decrease, in the population. Among the cities which show the largest increase is Berlin, which has added over 207,000, or 12.3 per cent, to the number of her inhabitants, making her present population 1,884,345, not including the suburban cities. Including her suburbs, Berlin numbers 2,500,000.

The city that has increased most rapidly is Nuremberg, which in five years

has added 98,357, or 60 per cent, in a total population of 260,743. This is due largely to the situation of Nuremberg at the point of junction of many highways and of seven railroads. The city of Posen has increased by 42,912 since 1895, largely by the influx of farmers and agricultural people from the country, more especially from Prussia.

Stettin now numbers 209,988 souls, an increase in population of 69,264, owing to its position as the seaport of Berlin.

Hamburg has added 79,117, making a population of 704,069; Munich, 87,502, making a total of 498,503. Leipsic has gained 55,126 in a present population of 455,120, Dresden 58,909 in 305,349, and Frankfort has increased 58,534, making her population 287,813.

These figures show clearly that the Germans are becoming more and more a manufacturing people. The land-owners are becoming alarmed and are even discussing the advisability of importing Chinese to work on their farms.

The population of the empire is 56,345,014, an increase of about four million, or of 7.78 per cent within five years. It is interesting to note that there are nearly a million more females than males, whereas in the United States this proportion is reversed.

EFFECT OF SNOWFALL ON WATER SUPPLY.

SOME very interesting conclusions have been published by the experts of the U. S. Weather Bureau, who have for several years been studying the effect of winter snowfall on the water supply of the succeeding summer. The observations have been confined to the arid regions of the west, more particularly Colorado and Idaho, where the rivers and streams derive their principal water supply from the melting of the snow on the mountains.

The generally prevalent belief that a winter of heavy snowfall is succeeded by swollen streams in spring and summer is not necessarily correct. It is not the quantity of snow that falls during the winter so much as the condition of the soil when winter sets in, the quality of the snow, and the time when it falls, that determine whether streams shall continue full late in the season and furnish abundance of water for irrigating canals. An unusually heavy snowfall in March will certainly be followed by drought in late spring and summer, unless this snow was preceded by a snowfall in the early winter. It is the snow that falls in November and December, and thus becomes packed hard during the winter and melts slowly in the spring and summer, that keeps water in the streams till summer is nearly over. The snow that falls in March and February has no time to become packed and hardened. The first warm breath of spring melts it with a rush, the streams overflow their banks, freshets flood the country for a few days; then gradually the streams subside and a drought ensues.

The issuing of special snow bulletins has been continued this winter by the section directors of the U. S. Weather Bureau in Colorado, Montana, Idaho, Utah, New Mexico, and Wyoming. These bulletins give the average amount of snow on the ground, the amount in the timber line, and the depth of the snow at or near the mountain summits. From their knowledge of the depth, character, and distribution of the snow, the Weather Bureau experts are able to give a reliable general forecast of the water supply for the ensuing season for the different streams of the arid section. The farmer thus learns months in advance the quantity of water his irrigating ditches are likely to receive. The sheep-herder also studies the snow bulletin with profit. In early spring bands of sheep begin to roam the prai-

ries, keeping, of course, close to water. Often the sheep may travel 400 to 600 miles, and by knowing the character and amount of the snow in the mountains, the herder can follow a route where water will be plentiful.

GEOGRAPHIC NAMES.

THE following decisions were made by the United States Board on Geographic Names, February 6, 1901 :

Ambrose ; the channel across Sandy Hook Bar, New York Harbor, formerly known as East Harbor, was renamed Ambrose Channel by an act of Congress approved June 6, 1900. In that act it is "*Provided*, That the so-called East Channel across Sandy Hook Bar, New York Harbor, for the improvement of which provision was made by the river and harbor act, approved March third, eighteen hundred and ninety-nine, shall hereafter be known as Ambrose Channel" (Statutes at Large, 56th Congress, 1st session, pp. 588 and 627). The name Ambrose is here included *not* as a decision of the Board, but as a decision by Congress.

Conaskonk ; point, Monmouth County, New Jersey (not Conaskonck).

Cove City ; township, Crawford County, Arkansas (not Core).

Garrett ; hill in Middletown, Monmouth County, New Jersey (not Garret nor Garrett's).

Guttenberg ; post-office and railroad station, Clayton County, Iowa (not Guttenburg).

Kekurnoi ; cape near Cold Bay, Shelikof Strait, Alaska (not Kahurnoi, Nelupaki, nor Nukakalkak).

Kessler ; mountain and triangulation station near Fayetteville, Washington County, Arkansas (not Kestler).

Klahini ; river tributary to Burroughs Bay, Behm Canal, southeastern Alaska (not Clahona nor Klaheena).

Leechville ; post-office, Beaufort County, North Carolina (not Leachville).

Steele ; point, the easternmost point of Hinchinbrook Island, Prince William Sound, Alaska (not Bentinck nor Steel).

Tuttle ; lake, Polk County, Wisconsin (not Swahn).

West Point ; United States Military Academy, New York (not West-point).

CHARTING THE HARBORS OF THE PHILIPPINES.

Preliminary steps have been taken by the U. S. Coast and Geodetic Survey for charting the harbors and coast of the Philippine Islands. A sub-office of the Survey has been established at Manila, in charge of G. R. Putnam, who has a force of men collecting material to assist in the work. In the early spring active work will be commenced and pushed, so that it is hoped that sufficient accurate data will have been obtained by the fall to enable the publication of charts of the larger harbors among the islands. There are no charts of the many minor ports in the islands that serve as points of distribution for the inter-island trade, and these also must be charted.

GEOGRAPHIC LITERATURE

The Century Atlas of the World. Prepared under the superintendence of Benjamin E. Smith. New York : The Century Co., 1899. \$7.50.

The Century Atlas, which was first published in 1897, and followed by a second edition in 1899, has doubtless been consulted at various times by every reader of this Magazine. A review or notice of the Atlas would now be superfluous. The publishers, however, have made such a generous proposition to the members of the National Geographic Society, and to the members of one or two other scientific bodies in the United States, that the great value of the work should again be emphasized.

The Atlas was originally published as a separate volume to enable subscribers to the Century Dictionary to complete their sets. Of the edition a few hundred copies remain. These the publishers have offered to members of the National Geographic Society at one-half the original price (\$7.50 instead of \$15). The Atlas will not be sold separately as soon as these copies are disposed of, and can then be obtained only by purchasing the entire set of 10 volumes that comprise "The Century Dictionary and Cyclopedia."

The Atlas contains 117 double-page maps, 138 inset maps, and 43 historical and astronomical maps. There are nearly 200,000 references to places in the indexes. To each of the principal States two or three maps are allotted, showing all the rivers, lakes, and hills in great detail. Maps of the large cities with their environs are presented, and the harbors of great seaports are also clearly charted. In its foreign maps the Century Atlas excels, the maps of China and the Far East being especially valuable.

Moore's Meteorological Almanac and Weather Guide. By Prof. Willis L. Moore, LL. D., Chief of United States Weather Bureau. With illustrations and 32 charts, pp. 128. Chicago and New York : Rand, McNally & Co., 1901. \$0.25.

Unlike the traditional almanac that is crammed with queer statements and queer dates, this little book is a reservoir of reliable information for "the farmer, the horticulturist, the shipper, the mariner, the merchant, the tourist, the health-seeker, and for those who wish to learn the art of weather forecasting."

Perhaps the most interesting and valuable chapter is that on "the construction and the use of the weather map," which explains how an amateur, by consulting the government daily weather chart, can follow the track of storms, and with considerable accuracy forecast the weather. The difference between the cyclone and the tornado, terms usually used as synonymous, is emphasized in another chapter. "The cyclone is a horizontally revolving disk of air covering an area 1,000 to 2,000 miles in diameter, while the tornado is a revolving mass of air of only 100 to 1,000 feet in diameter, and is simply an incident of the cyclone." Prof. Moore states, under the subject of "Protection against Frost," that, in his opinion, with approved appliances, the fruit districts of California and the orange groves of Florida could secure material protection against frost. Other instructive chapters are : "Long-range Forecasts," "The Galveston Hurricane of 1900," "Loss of Life and Property by Lightning," "Weather Bureau Kites," and "Temperatures Injurious to Food Products."

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings.

February 1, 1901.—President Graham Bell in the chair. Señor Dr. Don Juan N. Navarro, Mexican Consul General in New York city, delivered an illustrated address, "Mexico of Today."

February 15, 1901.—Vice-President W J McGee in the chair. Mr. Oscar T. Crosby delivered an illustrated address, "Explorations in Abyssinia in 1900."

Technical Meetings.

January 25, 1901.—President Graham Bell in the chair. Prof. Alfred J. Henry, of the United States Weather Bureau, read a paper on the anomalous distribution of rainfall in the Gulf and South Atlantic States during the eleven years 1889-1899. Ordinarily, Professor Henry said, years of fat and lean rainfall follow each other in a very irregular procession. A single dry year may be followed by a second and even a third, but rarely by a fourth. Wet years likewise may occur in groups, but the number of years in a group seldom exceed three.

In the case to which attention was particularly called eleven consecutive dry years were experienced. The annual deficiency at the several stations varied largely. In some years it was not more than 10 per cent of the mean annual fall; in others it was as much as 50 per cent. Happily the mean annual fall in the region referred to is so great that an annual deficit of 50 per cent does not create serious alarm.

Dr. H. C. Frankenfield inquired whether the deficiency in large cities was due to general causes or to steadily growing artificial conditions, such as the increased use of electrical appliances? Professor Henry replied that the defi-

ciency was common to both cities and small towns and even to exposed points on the sea coast. It was probably due in part to a shifting in latitude of the paths of storms and to a diminution in the number of tropical disturbances arising in the Gulf of Mexico or advancing toward the southern coast of the United States from the Caribbean.

Prof. Willis L. Moore called attention to the very great paucity of meteorological records and the exceedingly short time that such records had been continued. We should have, he said, at least a hundred years' observations before we could hope to account for such marked variations as had been described.

Mr. N. H. Darton read a paper entitled "The Powder River Range in Eastern Wyoming." The title of Mr. A. C. Spencer's paper was "A High Plateau in the Copper River Region of Alaska," an interesting description of certain physiographic features of that section of Alaska. In "The Distribution of Trees and Shrubs in Alaska," by F. V. Coville, the speaker traced the zones of plant life in Alaska and gave several possible explanations of the strange absence of vegetation on the Aleutian Islands.

February 8, 1901.—President Graham Bell in the chair. Prof. Frank H. Bigelow read a paper entitled "*The Plateau Barometry of the United States*," the first public announcement of an important work that the Weather Bureau has been prosecuting during the last two years.

The reduction of barometric readings of pressure, taken at the stations on the Rocky Mountain Plateau to the sea-level, has been a problem of special importance to the Weather Bureau, on account of their employment in forming daily weather charts. It is also one

of much scientific difficulty, because of some uncertainty in the elevation of the stations, and the proper temperature argument to be used in making the necessary reductions. With the lapse of time the necessary observations have accumulated to such an extent that it has become desirable to reduce the entire series taken during the past 30 years to a homogeneous system, with the epoch January 1, 1900. Professor Bigelow has been conducting this research for the past two years, and the work is now approaching completion.

The present investigation has included a complete remodeling of the station elevation data; the reduction of all the pressures to a normal station pressure, which has never been done before, by the application of a system of corrections for elevation, gravity, instrumental error, and diurnal variation; the careful determination of the temperature gradients in latitude, longitude, and altitude; the reduction to sea-level by new tables; the determination of residuals due to local abnormalities, to inaccurate elevations, and to incomplete series of observations, as for those of only a few years' duration, and the further correction of the station pressures to a homogeneous normal system.

This work will also contain normal maps of pressure, temperature, and vapor tension on the three following planes: sea-level, 3,500 feet, and 10,000 feet. From these data it will be practicable, in connection with the gradients obtained from the International Cloud Observatories, to make good daily weather maps on the three planes above mentioned, and thus to provide further means of studying the behavior of storms and the atmospheric circulation generally, at other levels than that of the sea, to which the forecaster is at present confined for his predictions.

Mr. E. C. Barnard presented a plan of work in exploratory surveys.

Announcement of Meetings.

March 1.—"The Recent Famine in India," by Gilson Willetts.

March 15.—"The Two Ends of the Earth: Peary and the North Pole, and the Cruise of the *Belgica* in the Ant- arctics," by H. L. Bridgman and Fred- erick A. Cook.

March 29.—"Railways and Water- ways of the Russian Empire," by Alex- ander Hume Ford.

These meetings will be held in the Congregational church, Tenth and G streets northwest, at 8 p. m.

Technical meetings for the reading of papers and for discussion will be held in the hall of the Cosmos Club Friday evenings, March 8 and 23, at 8 p. m.

As previously announced, the subject of the afternoon series of lectures for this year is "The Countries of Asia." The dates and lecturers are as follows:

March 5.—"Western Asia," by Tal- cott Williams, LL. D., of the *Philadel- phia Press*.

March 12.—"Eastern Asia (China)." Name of lecturer to be announced later.

March 20.—"Southern Asia (India)." Name of lecturer to be announced later.

March 26.—"Northern Asia (Sibe- ria)," by Edwin A. Grosvenor, Profes- sor of Modern Governments in Amherst College.

April 2.—"Asia—The Cradle of Hu- manity," by W J McGee, Vice-Presi- dent of the National Geographic Society.

These lectures will be given in the Columbia Theatre, Twelfth and F streets northwest, at 4.20 p. m.

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THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XII

APRIL, 1901

No. 4

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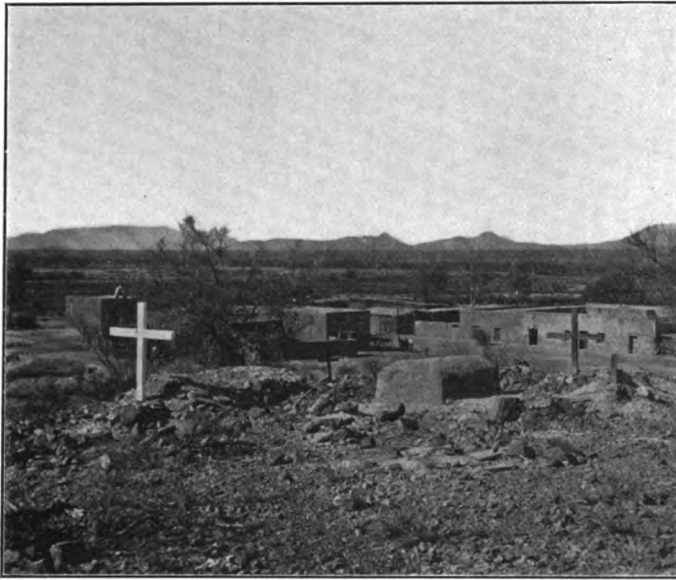
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"The Santo Domingo of today . . ."

prises a chief residence, a habitation for the aduana (customs office), a smaller house occupied by a minor branch of the family, a church with horseshoe-shape bell arch, and three or four shops and stables, all of adobe, flat-roofed and one low story high; besides, there is an abandoned ore mill of half a dozen steam-driven arrastres, while half a dozen Papago Indian huts form the customary "lower town." The rancho is large, skilfully irrigated, and so productive that corrals and sheds are filled with vigorous stock and abundant grain-hay and barley. The nearest low spur of Sierra Sonoyta better attests the antiquity of the settlement than the few houses and inhabitants; for there the evangelists and their civil successors have laid seven or eight generations of their dead in cross-marked sepulchres, while hard by lies the much more populous cemetery of the Papago dependents—those of the pagan dead in the form of a *k'i* (house), but built of stones and strewn with the bones of sacrificed horses; those of the

converts in similar form, though built of earth and decently marked with crosses outlined in pebbles. At both residence and aduana the ethnologic expedition was welcomed and supported by Don Bartolo Ortega (in the temporary absence of the eldest brother), as well as by the local customs officer, Señor Garcias, the way having been made easy by the courteous prevision of Mexican authorities.*

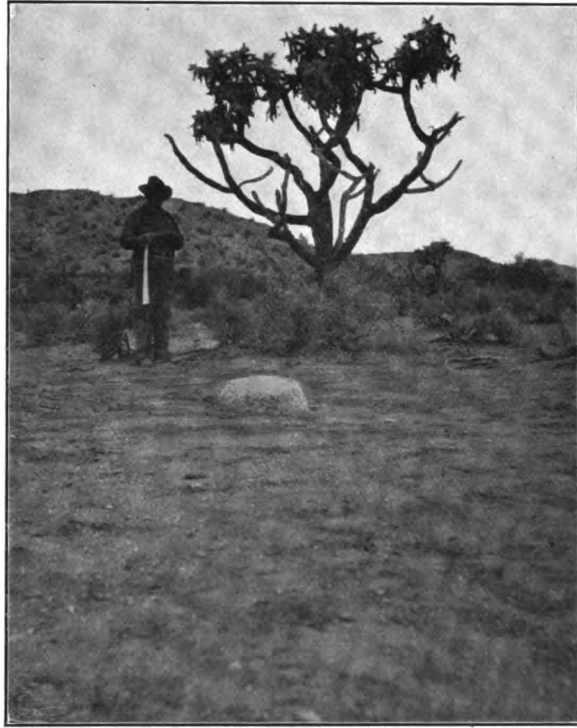
ON THE WAY WEST- WARD

On November 15, 1900, a six-mule wagon carrying all the casks and kegs

* His Excellency Manuel de Aspiroz, the Mexican Ambassador at Washington, and Excellencia Fernando Leal, Secretario de Fomento, in Mexico, were on this occasion, as on others, most liberal and obliging in furnishing authority for the international ethnologic work, while the Mexican authorities at Nogales were so generous as to send a representative to Phoenix, and thence with the expedition to Santo Domingo. The party comprised W J McGee, in charge; De Lancey Gill, artist; Professor R. H. Forbes, of Tucson, a guest during part of the expedition; John J. Carroll and Jim Moberly, stockmen; Aurelio Mata, Mexican customs officer, and Ramon Zapeda, Mexican interpreter, with Hugh Norris, Papago interpreter. The entire route was from Phoenix to Gila Bend; thence *via* Ajo to Quitobaquito and Santo Domingo; thence to Sonoyta and southward *via* Quitobac, Cozon, and Las Tajitas to Caborca; next westward to the Gulf shore (at the point recently occupied by the now extinct Tepoka tribe), and thence back, mainly by new routes, to Santo Domingo. From this point the old Yuma trail was traversed to Tinajas Altas, and thence *via* Gila City to Yuma, whence the expedition pushed on to the Cocopa country, near the mouth of Colorado river, afterward returning *via* Yuma and the Gila valley to Phoenix.

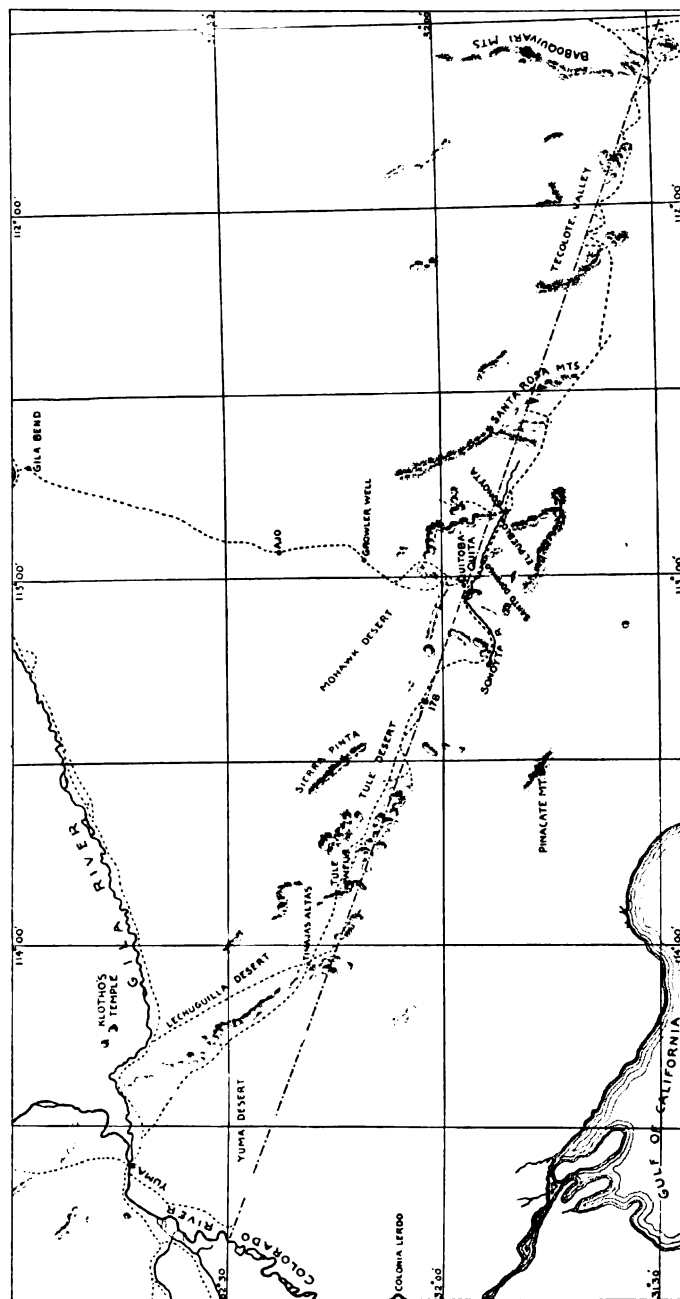
of both Santo Domingo and Sonoyta, besides a quarter-load of hay and grain, set out on the Old Yuma Trail under an arrangement with Don Bartolo to deliver water and feed in Tule Pass (sixty-odd miles away) by the third evening; next day the four-mule light wagon and the four saddle animals of the expedition were on the road betimes. Crossing the sandwash of Rio Sonoyta—a channel broad enough for the Ohio, deep enough for the Schuylkill, but dust-dry from bank to bank—the way meandered over a cactus-dotted plain simulating a vast alluvial deposit but revealing its origin by sheetflood carving in occasional projecting bosses of granite; passing monument 172, it swung a few yards north of the boundary to touch at Quitobaquito—the Papago village with five centuries behind it, and two adobe houses besides a half-dozen native huts within it. Here the entire white population (Mr. M. G. Levy, merchant, mine-owner, justice of the peace, and deputy sheriff) was avidly hospitable, the native residents attentive, as became the unusualness of the event; and the side-barrels and half-dozen canteens of the outfit were soon filled with the slightly alkaline yet palatable and wholesome water from the spring. Quitobaquito lies amid the southeasternmost foothills of a sierra bearing the name of spring and village; a dozen miles away the range divides, a spur setting off southward to form Cerro Salado (or Sierra de la Salada), and the trail veers partly to avoid this spur, partly to touch the “last water” near its tip.

Beyond Quitobaquito the ancient trail grows impressive. True, the narrow



“A cactus-dotted plain . . . revealing its origin . . .
in occasional projecting bosses of granite.”

stock-path followed by the wagons is in large part new; but, as well seen from the crest of Cerro Huerfano, the new track diverges from the old only because the old was so deep that it has become a storm-cut arroya—indeed for miles Rio Sonoyta abandons the ancient sandwash during its brief spurts of activity to convert the wheel-worn way into a flood-channel. Prehistoric sites and relics of the early stone age are sparsely scattered over the plain; the ruins of a Mexican rancho, with well and corral and acequias, lie three miles west of Quitobaquito; and there is an abandoned ganadero (stock ranch) at the “last water” five miles beyond, known commonly as “Agua Dulce” from the



The Country of the Old Yuma Trail.

alkaline sweetness of the water, properly as "Agua Salada" from its salinity. The "agua" is merely the small residuum of underflow and local seepage brought to the surface of the Sonoyta sandwash by impervious ledges of Cerro Salado in their subterranean extension across the valley; and the banks and bottom are encrusted with frost-like efflorescences of mineral salts. The water is fair for stock, just potable for men; it is a resort for half-wild cattle and horses and burros ranging the sierras and valleys for twenty miles beyond; but the latest sign is that of Don Bartolo's outfit, whose casks and kegs were filled twenty-four hours earlier. Here we pitch a tentless camp, with the first graves of the Old Yuma Trail on a low spur hard by; the sky is clear, though the air is heavy and warm; and Coyote (the Wise One of Papago lore) creeps near to sing his rain-song—a sleep-breaking wail well understood of the vaqueros.

THE SUMP OF THE SONOYTA

The first faint dawn of the 17th is ushered by a slow sprinkle from low clouds, forming a fog-bank half way up the Cerro, but so light overhead that the brighter stars glimmer through; and blankets are hurriedly rolled and loaded, breakfast is bolted, and the outfit is under way in the gray twilight. With sunrise the floating fogs fade, revealing the entire salt-pan in which Rio Sonoyta comes to an end—a basin of a score square miles, bounded on the north by Cerro Salado and its footslopes, on the west by minor ranges running down from Sierra Pinecate, and on the southeast by a sheetflood slope studded with volcanic buttes and mesas; while the old valley opening southwestward to the Gulf stops at a dam of hundred-foot dunes marking the margin of the Red Desert—a sea-born tide of sand slowly engulfing the lowlands of Sonora from Rio Colorado to Lobos Point. This is the "sink"

of the Sonoyta in the pioneers' vernacular, its evaporating vat in physical fact; after freshets it is lake or morass according to the volume of the flood, and then bottomless mire for weeks; now it is a Titan-patterned carpet of red, white, yellow, and black efflorescences, relieved by the greens of salt-enduring shrubbery on higher spots. On the hard-baked surface-crust the hoofs drum and the wheels rumble with a hollow reverberation more disturbing to animals than to men—albeit reminders to these of tragedies galore in the treacherous sump. A herd of wild burros see or scent the leading horseman from afar, and after deer-like stamps and snorts and other signals gather in a bunch, with dams and foals in the lead and males in the rear, to skim with amazing swiftness—recalling the wild asses of Arabia—down the rocky slopes and over the resounding playa obliquely across the trail toward the impassable sand-dunes; while an occasional band of half-wild horses may be glimpsed lurking behind mesquite clumps or scurrying for more distant shelter.

The trail leaves the Sonoyta basin about longitude $113^{\circ} 10'$, and ten miles south of the boundary; thence it wanders northwestward over rocky footslopes, bending slightly to avoid isolated buttes and curving more sharply to cross arroyos, for a dozen miles—to an imperceptible divide and the invisible frontier, where it enters a typical valley-plain of southwestern Arizona. Just outside the basin we overtake the supply outfit (which should have been thirty miles further on), and learn of the broken queen bolt and the long night ride by the Mexican to replace it, while the Indian staid by the stock; and we foregather to revise plans, swallowing apprehensions and a cold bite as the rare clouds of Papagueria gather to break in noonday showers and dispel the darkest danger of the desert. After arranging a rendezvous where galleta grass may be

found (for all stock trails are now left behind), the lighter outfit pushes on to outspan in sight of monument 178 (longitude $113^{\circ} 20'$)—the first "dry" camp on the Old Trail. Here sign of antelope and deer are seen, and the galleta is recovering slowly from the over-pasturage of the mid-century; Mr. Gill finds a curious aboriginal cache in a cavern of the volcanic butte on which the monument stands; and showers come and go throughout the night.

ACROSS PLAYAS AND MALPAIS

The second morning from Santo Domingo is cool and cloudy; blankets and saddles are stiff with the wet, the animals fractious; but three miles of smooth going and a rising sun bring comfort with the passage through a congeries of granite picachos rising abruptly from the level plain—and the pass is a gateway into Tule Desert. The first quarter of this expanse alternates between bare playa and a lax thicket of creosote (*Larrea*) growing in extraordinary luxuriance (clumps twelve feet high and branches fifteen feet long are common), while the silty floor is riven every few rods by giant shrinkage-cracks, often a foot or more wide and a yard or two deep. Fortunately the showers here have been light; yet the alkaline silt is tenacious mud, fetlock-deep for the mules and twice felloe-deep for the wagons. The next fraction of the valley is a tongue of the Red Desert, reaching in by the western end of Sierra Pinocate and stretching a dozen miles northward to lap the base of parti-colored Sierra Pinta; for five miles the old trail (which was lost in the playas) reappears here and there as a deep-worn way, partly filled and often obliterated by drifting sands; and the dead drag is the more dispiriting for the steady upgrade toward the malpais belt dividing Tule Valley.

This malpais—theme of many a trav-

eler's tale—forms a notable feature of the old route. It is a vast sheet of black lava stretching toward Sierra Pinta from a group of craters (and probably unseen fissures as well) a few furlongs or miles south of the roadway; but while so youthful, in geologic sense, that the principal lines and lobes of flowage and the rugged scarps of the margins remain distinct, the surface is weathered into a pavement of pebbles bedded below in light yellow sand but polished above by a "desert varnish" of remarkable brilliance; and the pebbles are set so close that the varnished surfaces form a nearly continuous mirror miles in extent, reflecting light and heat with painful intensity. The malpais belt forms a low mesa on which an occasional scrubby mesquite or saguaro (*Cercus giganteus*) or pitahaya (*Cereus engelmannii*) has found lodgment; it affords fine views of the Painted Range on the north, of the serrate crests and pointed peaks brought out by the afternoon sun in Tule Mountains, and especially of Sierra Pinocate, now falling into the rear on the left; and the last view serves to rectify the reports of the pioneers by showing that Pinocate is not a crater but a range, that the malpais stops miles short of its nearer base, and that it rises from the Red Desert quite like other ranges of western Sonora, though to a loftier height than any neighbor. Through the polished pavement of black malpais the old trail is distinct as a line on a map; the larger pebbles and boulders have been thrown out of the way of wheels by generations of travelers, while the smaller are ground into the ashen sand; and at intervals not exceeding a few hundred rods the bordering pavement is broken by cross-shape pebble-piles marking the journey's end now of a youth, again of mother and child, elsewhere of two or three adult companions, but more commonly of the single traveler, as told vaguely by the size and form of the heap—all

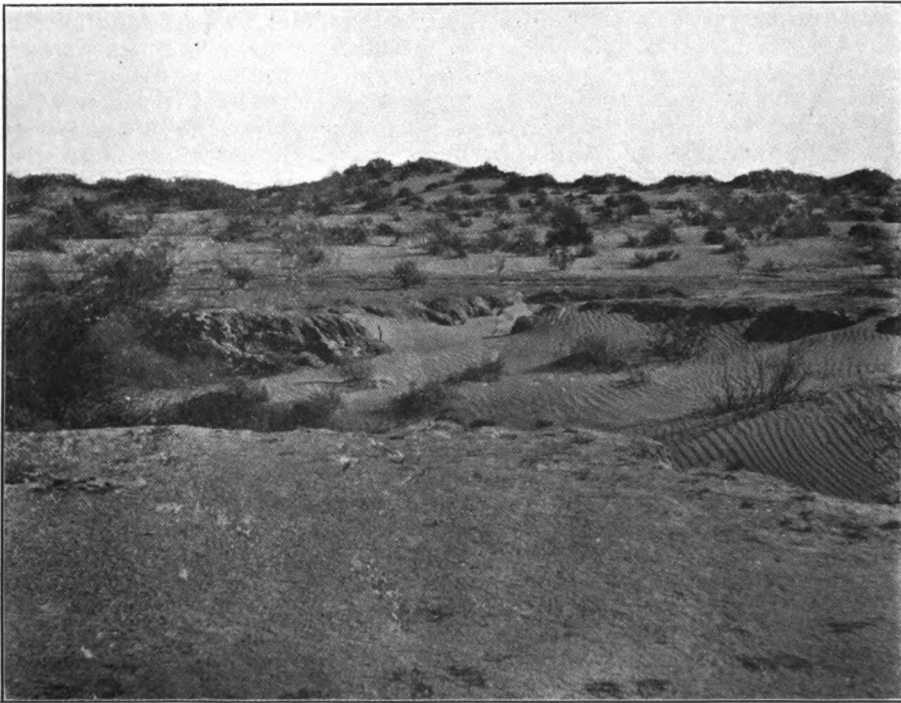
grim reminders that among the pioneers the malpais was a favorite place for dying.

A DESERT STORM

The stock are breathed on the nearer edge of the malpais, amid passing showers; then pushed on (the lighter outfit gaining rapidly) toward Tule Pass. Meantime the clouds about the southeastern sub-range of Sierra Tule grow dense, while those on neighboring crests lighten; then the cloud-mass veils the sub-sierra to its base, and half an hour later sets slowly northeastward over Tule Valley toward the trail, so slowly that both outfits are across the malpais and in the western half of the Red Desert tongue before the tempest strikes.

A typical desert storm (though of exceptional severity) was this, and instructive in every aspect. While among the peaks the cloud-bank was about

3,000 feet high and flattened dome-shape above, five or six miles in diameter at two-thirds of the height, and three miles across at the level of the plain (the rain-lines seen in the lower third converging from both sides); and these proportions seemed to be maintained, save for slight flattening, as the mass drifted into the valley and grew in size. It was most orderly in behavior; its rate of advance—after its clinging hold on the sierra broke—was eight or ten miles an hour; and the roar of rain and wind on drifted sand and scattered mesquites was audible half an hour, ominous for half as long, before the storm was actually at hand. Steadily the rim of cloud-bank pushed forward, passed overhead, and eclipsed the entire heavens save the northeastern eighth; light sprinkles fell from it directly downward through still air at first, but grew heavier as they caught



"A tongue of the Red Desert."

the northeasterly air-drift; then rather suddenly—so quickly that prompt action was required to protect the wagon as the stock turned tail—the wind stiffened without changing direction, while the shower became a torrent; and ten minutes later a 35-mile gale was driving the drops in a nearly horizontal sheet above the dune tops, while the temperature fell from some 70° to about 35° , and small hailstones formed apparently within a dozen feet of the ground. Ten minutes more and the gale was down to a breeze, the torrent to a sprinkle; then the rearward margin of the cloud-bank drifted away before the continuing breeze, and the low-swinging sun shone brightly. The cloud-mass pursued its way toward Sierra Pinta, evidently meeting a misty cape already hung about its shoulders; with the conjunction there was much lightning and some audible thunder; then the vapor-bank spread along the range, and either melted away or drifted on northeastward. During the twenty minutes of continuous pour the precipitation was $1\frac{1}{4}$ or $1\frac{1}{3}$ inches (estimated from catchment in water-pail, etc.); yet over the waste of drifted sand not a rill was formed, not a puddle was produced, not even a watery surface was seen save in the few "slick spots" (*i. e.*, alkaline silt patches) of the cowboys—the sand simply swallowed the flood like a sponge, and was visibly moist only to depths of 3 to $4\frac{1}{2}$ inches.

The storm over, the outfit heads again toward the distant pass, though Moberly lifts his voice to tender (thrice over, in typical cowboy emphasis) a "bet that them there fellers let the mules break the tongue when the storm come up on em;" and a half hour later the Mexican gallops up, on a bareback mule with toes locked inside the forelegs, to verify the inference. So camp is made in a woodless spot (save for scattered creosote bushes), while "los gringos" turn back to make repairs and bring up

the supply outfit to a point (about longitude $113^{\circ} 33'$) twenty miles short of that specified in the contract with Don Bartolo. It is the third night's stop, and the second "dry" camp on the old trail—though drenched blankets and hourly showers belie the vernacular designation for a desert camp.

THE WAY THROUGH TULE PASS

By daybreak of the 19th the wind shifts from southwest to northwest and grows chill, while gray clouds drive toward the dawn and crowd before the rising sun in a fashion more typical of deserts than of vaporous lands; and feed and water are transferred to the lighter outfit, while the supply team is turned back toward Santo Domingo—with a *douceur* to driver and aid, because they did no worse. The ancient trail forward is a deep furrow in the sands, and as these grade into the silts of the valley-margin toward Tule Pass the furrow becomes a series of sections of arroyos, normally setting obliquely across the trail, but diverted for rods or furlongs by the deeper cut of the wagon-way; and within five miles the arroyos bear marks of having run brimful for minutes or hours with the overflow from the sierra on the south. Gradually the way rises through sheetflood-carved footslopes, and then winds among buttes and granite walls toward an ill-defined divide; graves grow numerous again with the abundance of rocks to mark them; the year-old trail of an American on a shod horse and a Mexican on a shoeless beast forms a clear palimpsest over the 7-year-old tracks of the boundary parties; sign of deer and mountain sheep in pairs and flocks abound in the gulches, while coyote paths (unseen in Tule Desert) reappear. The pass is a meadow-like expanse of coarse granitic sand filmed with scrubby creosote clumps; here the trail divides, and a guide-post of sawn timber stands, soli-

tary and incongruous, to attest observance of a territorial law by the road supervisor of Yuma County—and incidentally to indicate "Tule Well" and advertise the name and wisdom of the last passer (the American horseman) in the feeling inscription "Agua Salada 75 miles—go back and fill your canteen. G. O. Taylor." Thenceforward the way is freshened and the mules heartened by the year-old trail of the conscientious supervisor.

Tule well (longitude $113^{\circ} 45'$) is a mile or two from the main trail; it is now a name on map and tongue, and a caving pit in rocky detritus with a barrel of liquid at the bottom—liquid even more saline than that of the Gulf, in addition to its overpowering flavor of copper salts and strong tinctures of sodden insects and drowned rodents, from which even the thirstiest horses turn in wry aversion. In the palmy days of the Old Yuma Trail this was a way-station, as adobe ruins still proclaim; before the range was overpastured there was a slender flora which helped to hold moisture, and the water was made tolerable by constant draughts and renewals; now it is but an echo and a delusion, if not a poison-brew for the chance traveler. A league west of the old well and a mile from the main trail there is a high tinaja (water-pocket) in the granite range running down from Blackhead Butte (Cerro de la Cabeza Prieta), in which water may be found by a hard climb in winter and spring or after local storms; but the chance is a desperate one during most of the year.

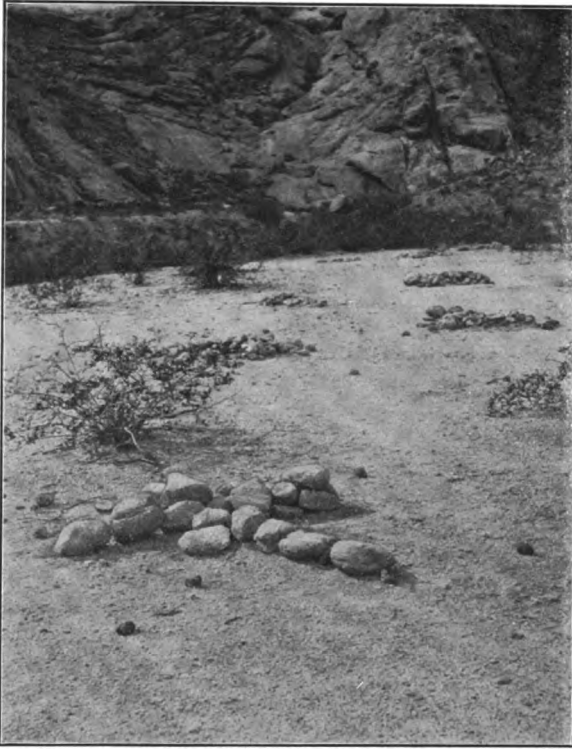
Beyond the main amphitheater of Tule Pass the trail winds among granite buttes, sierras, peaks, knife-edge crests in bewildering variety and labyrinthine confusion; gray and cream, pink and rosy walls of solid granite rise sheer from flat valley-floors of crumbled granite; the way wanders through a two-mile rincón—a great natural corral—of granite walls, in which a city might be housed

against cyclone or armed invasion; whole cubic miles of granite are constantly in sight—yet all this granite is but as a hand-specimen of northwestern Sonora and adjacent Arizona.

THE VALLEY OF LITTLE LETTUCE

Eight miles west of Tule Pass the rugged mass of Tule Mountains falls away, first on the left and then on the right, giving place to zones of malpais which slope down to Lechuguilla Valley; and here again the ancient trail is a thread of yellow in a field of black. Here, too, the narrow cemetery of the Old Yuma Trail grows more populous, for here the desert is most drear and water most distant; the grave-marks are too many to note—save the 30-foot circle of pebbles with a great pebble cross in the center recording the thirst-death of a family of seven who staked life on a demijohn of water which was accidentally broken. Captain Gaillard pictures this "cemetery," and adds: "The wagon tracks made when the poor Mexican drove his exhausted team to one side of the road were plainly visible thirty years afterward, and at the very spot still remain pieces of glass and wicker-work from the broken demijohn, and the skulls of the two horses." The sun swings low as we pass this pathetic memorial and others on the desolate malpais; and as it sinks behind Sierra Gila we push out a mile or two on the silty plain (longitude $113^{\circ} 55'$) and make the third "dry" camp, where the team-mules drink the last of the water, where ablutition is not, and where the slender store of hay and grain comes to an end. But the blankets are still damp and the night is chill—than which there are worse things in desert life.

Lechuguilla Valley is named from an inconspicuous agave-like plant of three or four slender straggling stipes a few inches high; it affects chiefly the roadway and arroyos, leaving the glaring



"Looking down on threescore cross-marked graves."

silts to wide-scattered tufts of creosote and rare mesquites; and on this waste, with its speck of slow-moving outfit, rises the sun of the fifth day from Santo Domingo, the fourth from the "last water." The Gila range unfolds into another labyrinth of granites; but it is not until high noon that we draw up the sheet-flooded incline (with wheels grinding anon on granites like those of the crests) and pull up the short arroyo to the classic spot of the old trail—las Tinajas Altas (the high tanks, longitude $114^{\circ} 5'$). Here, thirty miles from the nearest habitation, and looking down on threescore cross-marked graves—and how many unmarked no man can tell,—we find the outfit of a hunting party (now absent on the chase), and

after drinking deeply at the lowest basin fare sumptuously on their spoil.

THE HISTORIC HIGH TANKS

Las Tinajas Altas are a series of water-pockets (partly pot-holes, partly cataract pools) worn in the gulch bottom by torrents following the rare storms of the region. The lowest and largest is confined partly by great boulders and granitic débris, and is reached by stock; 100 feet of finger-and-toe climbing over smooth rock leads to two others, and in 50 feet more there is a third; still higher one of the party climbs to a fourth, and thence on to the tenth, stopping at a smooth slope apparently leading to the eleventh basin holding water the average year round—"Old the Taime," in the quaint spelling of the Yuma supervisor on a guide-board seven miles away. The climb

was made partly to examine the Indian mortars ground in the ledges and great boulders about every pool—mortars numbering hundreds if not thousands, some but a few decades old, but most so ancient that the polished bowls rise high above the unpolished rocks around them—mortars recording the visits of uncounted generations of devotees, to whom each laboriously-wrought basin was at once symbol of and invocation for precious food and life-giving water. One boulder bore 40 pits in its upper face, another 28; and up to the highest tinaja reached they are found in corresponding profusion. Most of them must have antedated Padre Kino, who passed this way just two centuries ago and mapped route and "Tinaxa" in 1702; and most of the others must have witnessed the long

procession of pioneers who trod the Old Yuma Trail to make California—and then watched the gradual settling of present desolation.*

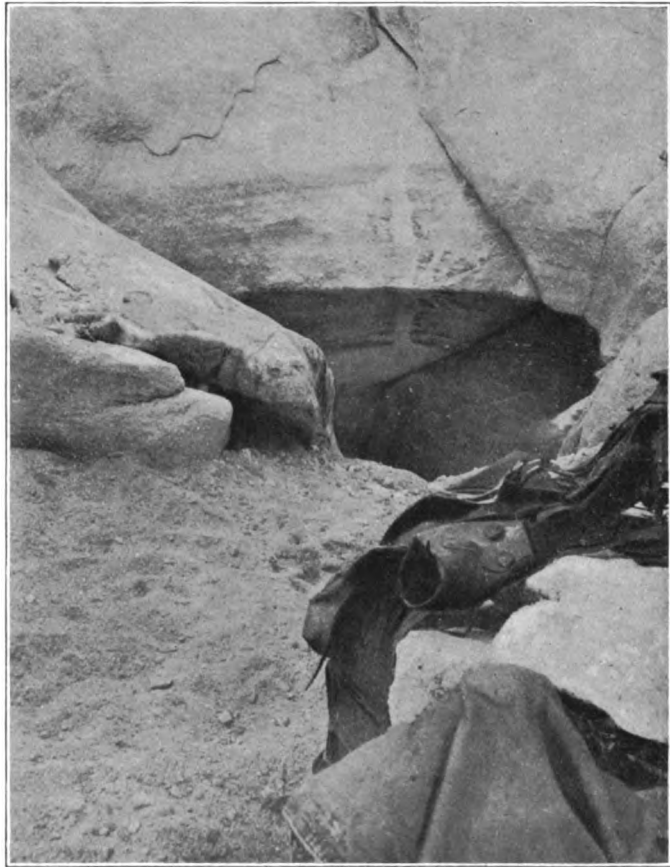
Besides their historic interest, the high tinajas present problems in geology and in meteorology; but it may be noted merely that they lie on the lee side of a rugged range, the first to catch the humid air-drift from Gulf of California, and that their catchment gulch divides exceptionally long spurs of the narrow sierra.

Six miles north of Tinajas Altas the fifth camp-fire is lighted, and the team-stock revel in corn-meal while the saddle animals experiment suspiciously with hardtack and other man-feed; for the breakdowns of the supply outfit cost a day in dearly borne provender as well as in time.

The next—and last—day is a hard one for the beasts, since the way skirts the lower slopes of a plain (alluvial in the valley bottom, but sheetflood-carved above), over which the waters from a local storm in the mountains flowed yesterday—flowed not in coalescing

* Kino's map is "*Tabula Californiæ Anno 1702. Ex autoptica observatione delineata à R. P. Chino è S. I.*" The padre's cartography, but not his orthography, has been followed in many if not most later maps of the region.

The colloquial rendering of the name introduces the local *laisson*—it is lumped as *Tinajas* (vowels Spanish).



"The lowest and largest is confined partly by great boulders and granitic débris."

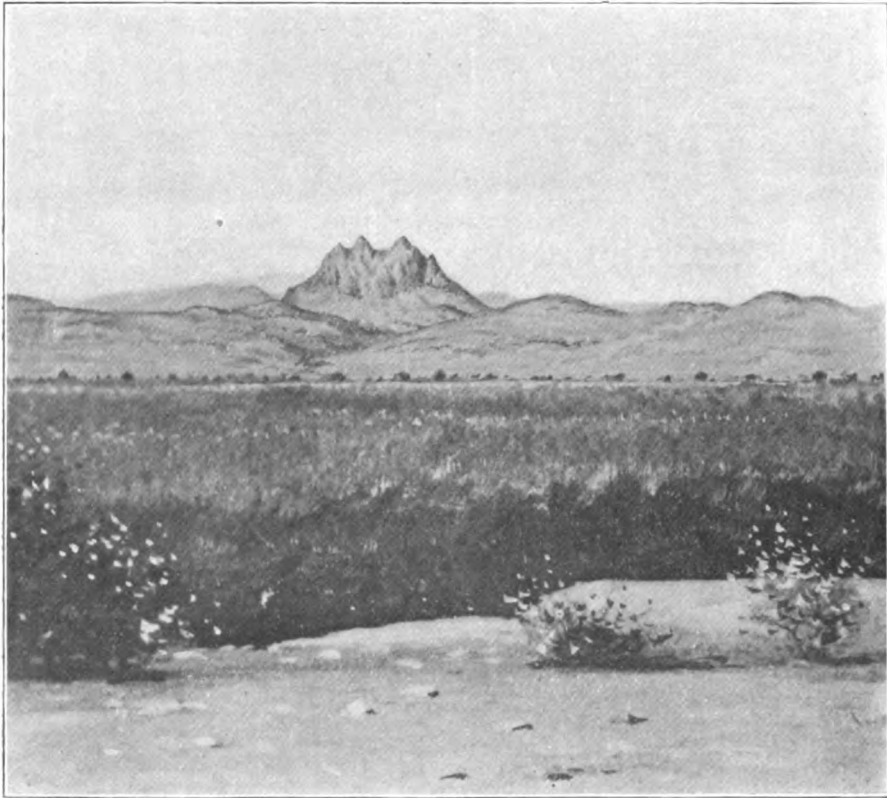
streams such as gather on humid soils in humid air, not in the continuous sheetflood formed when soil and air are of the dryness normal to the desert, but in a plexus of interlacing rivulets uniting and dividing every few yards or rods, and digging little arroyos across the trail to the average number of a hundred per mile. Into these the wagon plunges and out of them it is pulled by the fagged mules hour after hour, until the breaks of Gila River give respite. From daybreak onward Castle Dome

looms on the northern horizon 70 miles away, and plays with passing cloudlets made and unmade in swift succession; but the turreted volcanic mass just beyond the Gila (christened "Klotho's Temple" by Mr. Gill*) is more anxiously scanned as a landmark of growing promise. Even before midday stock trails—the first seen since leaving the Sonoyta range—begin to appear. In midafternoon a stray cowboy is spoken by Carroll; but it is long after nightfall of the sixth day from Santo Domingo before the animals are comforted with hay and barley from the single store in Gila City.

* Eight or nine miles east of Gila City; latitude $32^{\circ} 46'$, longitude $114^{\circ} 14'$, altitude 1,800 feet.

A LESSON OF THE TRAIL

No traveler over the Old Yuma Trail can fail to feel the incongruity of its present condition with its past history. It is the way of the western world to grow in population and wealth, to increase in industrial and intellectual tension; yet most of this ancient way is peopled only by graves, enriched but by memories, nearly as lost to labor and to thought as the sand-tombed cities of Arabia and farther Turkestan. The routes of Cabeza de Vaca and de Soto and Coronado are gone save to delving historians, the trans-Appalachian roads of our own grandsires are largely forgotten, many of the trails of the argonauts are effaced beyond retracing; but America probably presents no other lapse



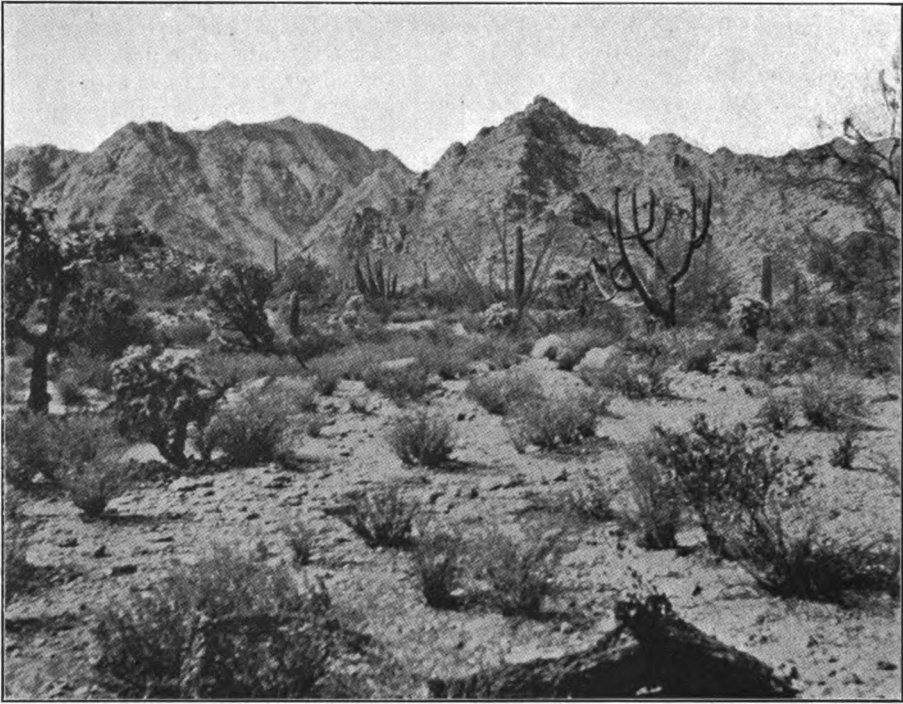
"The turreted volcanic mass . . . christened 'Klotho's Temple' by Mr. Gill."

from populous activity to utter desert so complete as that of the zone trodden by padre Kino and five generations of followers—and the lapse seems the greater because so uncharacteristic of occidental progress.

There was reason enough for the abandonment of the old route as a line of travel and traffic; the increasing safety of shipping first invaded its claims, the partition of Mexico next curtailed its functions, and the railways spanning the continent finally tapped its reservoirs at both termini; yet the factors leading to the abandonment of the route only partially explain the desertion of its purlieu, and serve rather to fix attention on the fact that the entire zone traversed by the trail was gradually impoverished by the long-continued—and short-sighted—overtaxing of its meager resources. When the earliest Caucasian pioneers came, they found the province peopled sparsely with semi-migratory Papago Indians, who wandered afar in search of water, located fields and villages even by the temporary wettings of chance storms, and erected shrines about the more permanent springs and tinajas—Tinajas Altas among others. They also found a fauna of deer and antelope and bighorn with their carnivorous consociates, as well as birds, rodents, reptiles, and insects in wide variety and moderate abundance; and as the basis of the motile life they found a varied flora delicately balanced between hard habitat and dependent fauna through eons of adjustment. True, the aggregate vitality was but a fraction of that characteristic of humid lands; yet the deficiency was partly made up by a longer individual life and a closer vital economy growing out of the exceptionally perfect solidarity characteristic of the living things of arid regions, so that the sum of living resources was sufficient for reasonable demands. Two or three generations of Caucasians drew on these resources in the easy way of rest-

ful latitudes without serious detriment; the missionaries and couriers followed tribesmen's trails to tribal domiciles, and shared water and food with or without material exchange; their animals found forage in grassy and shrubby spots, while they were able to take game or gather cactus fruits in season with little effort; and so long as they were few, the vital balance established through eons of earth-making was little disturbed. With the third or fourth generation and the gradually increasing numbers of Caucasian travelers, the resources began to suffer; the forage grew scant, the wantonly harried cacti withdrew from the nearer borders, the big game became wary and betook to other ranges; with the decimation of plants and the trampling of stock the soil grew less retentive of the scant moisture, in a ratio probably higher than that following deforestation of humid lands, so that the meager ground-water disappeared, the smaller springs went dry, and the chance tempest brought bane rather than the boon of the olden time; and with each decade of vital degradation the Papago tribesmen withdrew to remoter haunts, or else degenerated into a parasitical dependence on the wells and wastage of the whites. Still the natural balance was not utterly destroyed until the Anglo-Saxon came with that intense energy which balks at no obstacle, brooks no delay; he deepened old wells and dug new to catch the last drops of dwindling ground-water; he not only drove herds to devastate the enfeebled flora along the way, but stocked the adjacent ranges with cattle and sheep to supply the needs of multiplying travel; and he stopped only at the fortunate conjunction of railway-making on more northerly lines with the utter eradication of the grasses and other forage plants along the old route, and the consequent extinction of the useful fauna and destruction of the minor waters.

The American desert stands apart from



"Plains still mantled with herbage and grazed by herds of deer as in pre-Columbian times"

that of the Old World in superior vitality; with corresponding conditions of climate and soil, a peculiar flora of leafless, thorny, waxy-skinned, light-utilizing forms, and a distinctive fauna take the place of lifeless sand, and the characteristics of fauna and flora combine with several lines of geologic evidence to prove that the arid provinces grew slowly during several periods, running at least from the early Neocene to the present. It was during these periods that the unparalleled solidarity of our desert life was gradually developed;*

*As pointed out elsewhere, this solidarity matured on certain lines in agriculture and concomitant zoöculture in the very province traversed by the ancient route. Cf. "The Beginning of Agriculture," *American Anthropologist*, vol. VIII, 1895, pp. 350-375; "The Beginning of Zoöculture," *ibid.*, vol. X, 1897, pp. 215-230.

from age to age the forms and forces of animal and vegetal life coöperated in common strife against sun and sand, and were forced by the hard environment into a harmonious interrelation in which none could dominate without risk of starvation, none yield unduly without certainty of extinction. Into this complex mechanism the prehistoric forbears of the Papago insinuated themselves so gently as scarce to disturb the relations of parts; into the same mechanism the Papago themselves pushed their way harmlessly when driven into the outer deserts; but the natural interrelations were too delicate to withstand the violent entry of the Anglo-Saxon, and the weaker organisms withered before him. Other provinces have suffered from the brash vigor of Caucasian conquest; forests have been sacrificed and

woodlands despoiled into sterile wastes; fields have been ill-wrought into barrenness and then turned out to wash into neighboring waterways, thereby ruining both hill and dale; mines and quarries have been so unwisely worked as to check other industries for decades and entail public losses far exceeding personal gains. In legion ways the adjustment of American settlers to new environments has been destructive, yet no new contacts have been more disastrous than those between the pioneers from humid fatherlands and the finely-balanced vital solidarities of arid regions; and of all the examples of destructive contact between pioneers and precursors none are more impressive than those so clearly attested by the Old Yuma Trail.

Happily, the dark lines of the picture carry a brighter complement: Science—and American progress is but science practically applied—advances through experiences, both of success and failure; no success could be more instructive than the failure attested by the aban-

donment of the country along the historic route; and this failure at once attests the folly of disregarding natural conditions when settlement is pushed into unfamiliar regions, and indicates the wisdom of weighing natural conditions as means of nature-conquest. The natural potentiality of the country traversed by the old trail is proved by the condition of the neighboring plains on the southern side of the Sonoran boundary which have never been overstocked—plains still mantled with herbage and grazed by herds of deer as in pre-Columbian times; and the slow resetting of shrubbery along the old way gives definite promise of restoration to the early state, while the moderate fruitfulness of the Sonoran plains points a way in which the growing resources may be utilized by patient adjustment of industries to natural conditions.

So the wisdom, if not the imperative necessity, of adjusting means to conditions in the reclamation of arid lands is the leading lesson of the Old Yuma Trail.

ADVANCES IN GEOGRAPHIC KNOWLEDGE DURING THE NINETEENTH CENTURY*

BY BRIG.-GEN. A. W. GREELY, CHIEF SIGNAL OFFICER,
U. S. ARMY

IN these days geographic exploration means not merely the topographic distribution of mountain or river, of lake or plain, but also the determination, in a cursory manner at least, of existent vegetable and animal life, of climatic conditions, and especially of the ethnology of inhabited areas.

* Revised and republished by courtesy of the publishers of the *New York Tribune*.

In forecasting the evolution of any aspect of the twentieth century the soundest base must be the advances of the nineteenth century along like lines of research. Judged by this standard, the present century will perfect the aspirations of the explorer of the last century to make known the entire surface of the earth. Few appreciate the enormous advances in geographic knowledge dur-

ing the last one hundred years, which may be summed up in the general statement that fully 60 per cent of the world's land area was unexplored in 1800, while scarcely 10 per cent now remains unknown.

At the commencement of the last century the four greatest geographic problems were the Northeast Passage, the Northwest Passage, the sources of the Nile, and the North Polar quest; the last only remains.

ONE ARCTIC PROBLEM SOLVED

The Northwest Passage first yielded its secrets to the energetic explorers of this age, the result being attained by a series of voyages, almost entirely under British auspices, that are unsurpassed in number, duration, and heroism. Attempts for a Northwest Passage, interrupted by the death of the great navigator, James Cook, who lost his life therein, were renewed owing to the success of William Scoresby, Jr., in exploring East Greenland, 1817-'22. Prosecuted both by land and sea, material advances came through Parry, Ross, and Franklin, 1819-'35, while the voyages of Austin, Belcher, Collinson, McClintock, McClure, Rae, and others in search of Franklin, 1845-'59, completely solved the mystery.

Parry, in three notable voyages, explored the greater part of the islands and waterways north of America half way from Baffin Bay to Bering Strait, passing north of the magnetic pole. John Ross explored the Felix Boothia Peninsula, the north point of the continent of America, while his lieutenant and nephew, James C. Ross, located the north magnetic pole at Cape Adelaide, 70 degrees 5 minutes north, 96 degrees 44 minutes west. The north coasts of America were outlined by the land journeys of Franklin, Beechey, Dease, and Simpson, 1819-'46, from King William Land west to Point Barrow.

Other notable advances have been made in Arctic America by Inglefield, Kane, Hall, Nares, and Greely in Grinnell Land and Northwest Greenland; by Drygalski, Geisecke, Garde, Holm, Steenstrup, and other Danes in Western Greenland; by Scoresby, Graah, Koldey, Payer, Nordenskjöld, Garde, Clavering, Holm, Ryder, and Peary on the east coast, while Nansen and Peary have crossed the inland ice, the latter to the extreme southeastern point of the new land to the north of Greenland, discovered by Greely in 1882.

ADVANCES TOWARD THE NORTH POLE

Spitzbergen has been fully explored by Gaimard, Nordenskjöld, Torrell, Leigh Smith, and Conway. Weyprecht and Payer discovered Franz Josef Land, whose limits have been extended and defined by Leigh Smith, Jackson, Nansen, and Wellman. De Long drifted from Bering Strait to the New Siberian Islands, and Nansen's extraordinary continuation of De Long's drift around Spitzbergen has most materially advanced our knowledge of the Siberian and Polar Seas.

Advances toward the North Pole have been made through the exertions of Scoresby, 81 degrees 30 minutes north; Parry, 82 degrees 45 minutes north; Nares, 83 degrees 20 minutes north; Greely, 83 degrees 24 minutes north (the most northerly land as yet); Nansen, 86 degrees 14 minutes north, and Abruzzi, 86 degrees 33 minutes north, within 207 geographic miles of the Pole.

As to the Northeast Passage, Nordenskjöld, having faith in both its scientific value and practicability, selected Palander as his navigator. Sailing from Tromsö in 1878, they passed Kara Sea successfully and readily rounded the north cape of Asia. Beset by ice and obliged to winter within 120 miles of Bering Strait, Nordenskjöld com-

pleted the circumnavigation of Asia in 1879.

Within the Antarctic circle, to the south of Patagonia, Palmer, Bellinghausen, Biscoe, Larsen, and Gerlache discovered Palmer Land and adjacent islands. To the south of New Zealand Belleny found islands, and James C. Ross added to his arctic laurels by discovering ice-clad Victoria Land, with its flaming volcanoes, and in locating the south magnetic pole. South of Kerguelen is the Enderby Land of Biscoe, while south-east of Tasmania an archipelago of desolate islands, located by Wilkes and D'Urville, marks the northern limit of ice-clad Antarctica.

EXPLORATION OF AUSTRALIA

The greatest southern confederacy, Australia, has a European population exceeding five millions; but in 1800 its two thousand settlers did not even have a country with a recognized name. As New Holland, it appeared on the best maps, a featureless central area, with its outlined coast largely conjectural. Surveys of the coast, begun by Bass and Flinders, were finished by King, 1822; Wickham and Stokes, 1837-'43. Inland, Hughes solved the hydrographic problem of the Murray watershed, Eyre traced the south coast along the Great Australian Bight. The central desert was made known by Mitchell and Sturt, while Grey and Gregory explored in the northwest and Leichardt and Kennedy in the northeast. The most fruitful journey was that of Stuart, 1858-'62, from the inhabited south coast to the extreme north, which opened a fertile, well-watered district to colonization. The western desert has been explored here and there by Forrest, Warburton, and Giles, the last named having twice traversed the great Sahara, east and west.

New Zealand first came to our knowledge by missionary labors, 1814-'30,

and later by commercial extensions and gold-hunting. New Guinea has been explored in the last half century by Wallace, Meyer, Forbes, Von Schleinitz, and Dallmann.

OPENING UP SOUTH AMERICA

Of the Americas, the longest known is least explored. South America, however, was fortunate in the beginning of the century, 1799-1804, with such investigators as Humboldt and Bonpland, who traversed Venezuela, determined the remarkable bifurcation of the Orinoco, visited Magdalena, Quito, and the volcanoes. This journey was not only locally important, for it gave an extraordinary impulse to the comprehensive study of the earth. Von Eschwege, Von Wied, Saint-Hillaire, Spix, and Martius explored the interior of Brazil from the Amazon Basin; D'Orbigny and Castelnau devoted themselves to the geography of the central regions between the Rio de la Plata and the Amazon; Darwin, Wilkes, and Gillis explored the coast lines of the continent; Wallace and Bates did wonderful scientific work in the Amazon Basin, followed by Agassiz and a host of other explorers. Of the tributary basins of the Amazon, Steinen has mapped the Xingu, Church the Madeira, Chandless and Labre the Purus.

In the Guianas Schomburgk's researches are the most valuable. In late years the most important explorations are doubtless those of the French international polar expedition at Cape Horn, under Martial.

PATHMAKERS IN NORTH AMERICA

Of the continents none other has so benefited by the explorations of last century as North America. To the genius, tact, and energy of Humboldt was early (1804) due modern geographical knowledge of Spanish America, which was

materially increased by the explorations of Pike from St. Louis to Chihuahua, *via* the Kansas, Arkansas, and the Rio Grande.

Kotzebue and Zagostin in the first half, and Dall, Kennicott, and Allen in the last half, of the century have outlined the general features of Alaska. In the Stikine, Klondike, Tanana, Nome, and Koyukuk regions the gold hunters have explored thoroughly. In Canada the early discoveries of Franklin, Richardson, Rae, and Back have been supplemented by Petitot in the Mackenzie Basin, Dawson and Ogilvie in the Yukon watershed, Bell and Tyrrell around Hudson Bay, Boas in Baffin Land, and Low in Labrador.

As regards the United States, the country west of the Mississippi was almost entirely unknown in 1800. The early trans-Mississippi explorations form one phase of the history of the United States Army. The most fruitful in results of such journeys is that of Lewis and Clarke (1804-'06). They ascended the Missouri from mouth to source, crossed the continental divide, traced thence the Snake and Columbia to the ocean, and returned *via* the Yellowstone. For the first time the United States was crossed from the Atlantic to the Pacific. This demonstration of the practicability of overland travel was an essential factor in the occupancy of Oregon, which gave the first foothold for the American on the Pacific Coast.

MAPPING THE GREAT WEST

Pike explored the valleys of the upper Mississippi, Arkansas, and Rio Grande, crossed part of Chihuahua and Texas, then unknown countries. Bonneville (1832-'36) explored the valleys of the Platte, Green, and Yellowstone, and, pioneer of the Oregon trail, twice crossed to the Columbia, passing west *via* the Snake River, the Grand Ronde, and Blue Mountains. He also made known

the great basins of Salt Lake and Humboldt River and the pass across the Nevadas to the Sacramento. Bonneville first correctly charted the hydrography of the trans-Rocky Mountain regions, and eliminated the Rio Buenaventura and other mythical streams. Frémont's journeys were important as initiating an extensive series of scientific explorations. Kearney surveyed the boundaries of Texas and Louisiana, Boone the country between the Arkansas and Canadian, and Emory from Leavenworth to San Diego *via* the Arkansas, Del Norte, and Gila.

Among the many expeditions may be mentioned that of Simpson to the Navajo country, Stansbury to Salt Lake, Sitgreaves to the Zuñi and Colorado Rivers, and Mullen from Walla Walla to Fort Benton. Important surveys are those of the Pacific Railway route by McClellan, Whipple, Parke, Williamson, and Derby; the Mexican boundary by Emory, the northwestern boundary (1857-'61), and in later years those of King, Hayden, Powell, and Wheeler, which have elucidated most of the geographical problems in the United States.

RIVALRY IN ASIA BEGAN EARLY

In the geographical as in the political evolution of Asia the potent forces have been Great Britain and Russia, so that Northern and Southern Asia have been almost separate fields of enterprise for the dominant nation, with Central Asia as debatable ground for rivalry by both nations. In Northern Asia explorations in the early century were confined largely to the local extensions of knowledge, except additions to the New Siberian Islands by Samkif, Sirovatskof, Hedenstrom, and Sannikof, 1805-'11; of the Siberian Ocean by Wrangell and Anjou, 1820-'23, and in Nova Zembla by Lütke, 1821-'24; Pachtusow, 1832-'35, and Baer and Zivolka 1837-'38.

The foundation of the Imperial Russian Geographical Society in 1845 gave impetus and direction to Asiatic discoveries, increased knowledge of the Russian Empire being the aim. From 1849 to 1857 Hoffman, Aksakof, and others explored the Ural region and the ethnographic features of Russia proper and of Western Siberia. Extending in scope from 1857 to 1871, besides Siberian researches in Amur, Usuri, and Saghalin, the Caucasian and Aral-Caspian regions were explored in the southwest, while to the east many expeditions entered Turkestan, Manchuria, Khorassan, and Mongolia.

Between 1871 and 1885 Central Asia, Mongolia, and Western China were explored, largely through Prjevalsky, and international polar stations were established on the Lena and in Nova Zembla. Severtsoff and Fedchenko explored Turkestan minutely; the deserts of northwestern Siberia and Lake Baikal were examined and a sea route opened from Tobolsk by way of the Kara Sea to St. Petersburg.

TIBET IS A MYSTERY YET

During the last fifteen years attention has been paid to Caucasia, Turkestan, the Amur, and Black Sea regions. In these years perhaps the most interesting explorations are those of Hedin, who crossed the desert of moving sand hills between the Yarkand and Khotan Rivers, outlined the northern rim of the great Tibetan Plateau, and examined Lob Nor Basin.

Explorations in Southern Asia originated in the desire to extend inland the sphere of British influence. Political considerations speedily entered into the problem, and those barriers proved more difficult to surmount than physical obstacles. In reaching the Himalayan foothills, and later in passing across the ranges into Afghanistan and Tibet, the explorer necessarily awaited brief inter-

vals in the wars of conquest and occupation.

Manning succeeded in entering Tibet in 1811, but was soon expelled. Non-intercourse was so rigidly enforced that the British surveys had recourse to selected native agents, and most of the early advances were made through secret journeys of pundits, among whom Chandra Das stands foremost. As usual, much has been learned by missionary labors, especially in Tibet, through Huc and Desgodins, the latter also contributing much to a knowledge of Indo-China. In recent years both countries have been explored by Rockhill, Bonvalot, Little-dale, Szechenyi, Henri of Orléans, and others, especially the pundit Nain Singh, under conditions that leave much to be added.

Japan has opened her unknown empire to the world. While much has been done by Japanese travelers to make its geography known, yet the geological researches of Naumann should be noted.

MAP OF AFRICA FILLED IN

The extent to which exploration changed the map of Africa during the nineteenth century is known only to professional geographers. It is true that in 1800 the entire coast of Africa was known with some definiteness through the exertions of Portuguese navigators in previous centuries. Yet apart from the valley of the Nile geographic knowledge of the interior was confined to a scant hundred miles southward from the Mediterranean and northward from the Cape of Good Hope and to the estuaries of the Zambezi, Kongo, and Niger.

Geographic knowledge stopped almost within sight of the sea or the Lower Nile. Scarcely fifty years since there appeared, from 5 degrees north to 10 degrees north, on the best maps of Africa, the legend, "Kong Range, mountains supposed to extend across

the continent." Today it is known that this central area forms part of the great Kongo Basin, with a population of more than forty millions.

In outlining the march of exploration toward the interior of the "Dark Continent" only the most succinct account is possible. For clearness of statement, explorations are treated under five general heads: First, trans-Saharan, from the Mediterranean; second, the Niger regions; third, the lake regions near the Upper White Nile; fourth, the Zambezan region, and, fifth, the Kongo Basin.

According to different definitions of a desert, the Sahara varies in area from 2,500,000 to 3,500,000 square miles, of which the eastern third is generally known as the Libyan Desert. Hitherto this desert area, with scant water, intense heat, and whirling duststorms, interposed an inaccessible barrier between the Hemitic nations of the Mediterranean coast and the negro tribes of the Sudan.

SAHARA'S BARRIERS OVERCOME

Explorations of the Sahara were fruitless until Oudney, Denham, and Clapperton crossed (1822-'24) from Tripoli to Lake Chad, in the Sudan. Laing, following, crossed from Tripoli *via* Ghadames and Tuat to Timbuktu, the mysterious city of strangely exaggerated importance from previous centuries. Panet, Vincent, Duveyrier, and Lenz explored the desert between Senegal and Southeastern Algeria.

It was Barth who gave the first definite account of the Saharan region after a journey of great extent and importance. Starting from Tripoli, he crossed the Sahara to Lake Chad, passed Northern Hausaland to the Niger at Say, and thence reached Timbuktu. Returning northeast through Sokoto to Kukawa, he explored Bornu. Barth's journeys were of great value, for he not only made

known to the world the existence and accessibility of hundreds of thousands of square miles of fertile territory, but he also gave in five volumes an enormous amount of geographical information, in which he treated quite thoroughly the ethnology of the various tribes of the Central Sudan. His successor, Rohlfs, after exploring Southern Morocco, penetrated the Sahara to the oases of Tuat and Ghadames, and those of the districts of Fezzan and Tibesti. He then crossed from the Mediterranean to the Guinea coast *via* Bornu and Lagos, on the Niger, the first European to make the journey. Later (1873-'78) he explored the oases in the Libyan Desert.

The Sahara, instead of being a low desert of marine origin, is an elevated plateau, which has been enormously denuded by the disintegration of its rocks through temperature changes and the distribution of its dust by high winds. It is not entirely rainless; has many fertile oases and only needs abundant water to produce luxuriant vegetation.

The first Europeans to cross Africa from east to west north of the equator were Matteucci and Massari, who traveled from Suakin *via* Kordofan, Wadai, and Kano to the Niger. Nachtigal (1869-'70) made a journey from Tripoli *via* Fezzan to the Libyan Desert, where he explored the remarkable mountainous region of Tibesti. Examining the Lake Chad district, he reached Egypt *via* Wadai and Darfur.

NIGER AND NILE AN OPEN BOOK

The mystery of the Niger, long erroneously supposed to flow through the Sudan to the west, was partly solved by Mungo Park, who, starting from Gambia, in his first journey reached Segou, on the Niger. His second expedition (1805) ended in failure. Clapperton, renewing the survey, perished, but his faithful assistant, Richard Lander, definitely solved (1830) the mystery of the

Niger by descending from Bussa to the mouth of the stream.

French energy has explored Senegal and Gambia by the journeys of Rubault, Mollien, De Beauford, and especially Caillié.

The great mystery of the Nile sources, after twenty centuries of speculation, has been solved by the labors of various explorers, most largely by Baker, Speke, and Stanley. Its largest lake source, Victoria Nyanza, was discovered by Speke, who missed Albert Nyanza. Baker discovered the source of the Blue (Abyssinian) Nile and the Albert Nyanza of the main or White Nile. To Stanley belongs the honor of the discovery of the remotest source, Albert Edward Nyanza, which feeds the Albert Nyanza through the Semliki River.

The fabled Mountains of the Moon have given place in Eastern Africa to a most remarkable lacustrine system. The vast equatorial lakes cover extensive regions, feed some of the largest rivers of the world, and by their transportation facilities favor commerce. Their central situation between the Cape and Cairo, convenient to the Indian Ocean and on the confines of the Kongo Basin, caused them to be recognized as the central key to African domination by Germany and Great Britain, who now control the region.

The largest lake, Tanganyika, was discovered by Burton, while Livingstone contributed Nyassa, Moero, Bangweolo, and others. Joseph Thompson, exploring south from Tanganyika, discovered Lake Rukwa and also traversed unknown Masailand.

LIVINGSTONE'S GREAT WORK

The discovery of the equatorial lakes was of subordinate import to that of the Kongo Basin, which grew out of missionary labors in South Africa. To the genius and energy of two men, David Livingstone and Henry M. Stanley, are

primarily due the exploration and utilization of the vast unexplored regions between the Sudan and the Orange River.

Unquestionably the missionary Livingstone, who settled in Bechuanaland in 1841, was one of the greatest of African explorers. First discovering Lake Ngami, he turned his attention to the Zambezi Valley, and practically covered this basin in 1851-'56, and later, in 1858-'64, explored Lake Nyassa and the adjacent country. Most important results flowed directly and indirectly from the last journeys of his life, in 1866-'73, when, crossing the watershed to the very sources of the Kongo, he discovered Lakes Moero and Bangweolo, the Luapula and Lualaba Rivers, now recognized branches of the Kongo.

STANLEY

Stanley, who found the long-lost Livingstone, completed the exploration of the main Kongo Basin in a journey (1875-'78) which in its discoveries and results is unequalled in African exploration. His circumnavigation of the great lakes, Victoria Nyanza and Tanganyika, was important, but the crossing to the watershed of the Lualaba, which he proved to be the Kongo by following it to the Atlantic Ocean, was a journey of unsurpassed courage, persistency, and resourcefulness. His return to found the Kongo State was followed by extensive discoveries, such as Lakes Leopold and Mantumba, the Ubangi, Kasai, and other affluents of the mighty river. Stanley's geographic laurels were increased by his search for Emin Pasha, when he crossed Africa from the junction of the Kongo and the Aruwini over the Bantu borderland. He discovered not only an extensive and almost impassable forest, but also the ultimate lake source of the White Nile, Albert Edward Nyanza.

Stanley's exploration of the Kongo Basin was a potential force, second only

to that of Columbus' discovery of America. Each explorer opened up a new continent, and gave rise to scientific and philanthropic schemes which affected the progress of the world.

Europe awakened to the importance of the Kongo Basin, with its great lakes, its ten thousand miles of navigable rivers, which leave no part of the basin one hundred miles distant; its fertile valleys, its animal life and vegetable resources, and its millions of inhabitants. Africa speedily became the center of commercial exploitation, which was not confined to private enterprise. Most fortunately, by act of international conference the Kongo Free State, with an area of nearly a million square miles, became independent. Presenting the greatest natural possibilities, it practically bears, in interest and importance, the same relation to Africa as does the watershed of the Mississippi and its tributaries to the United States.

By rail and steamboat one now travels from the west coast, through the Kongo State, more than half way across Africa. Its revenue is counted by tens of millions of francs, its exports and imports increase steadily, and, apart from the 12,000,000 inhabitants of the French Kongo, it has a population of 30,000,000. The effect of the geographic evolution of Africa upon Europe may be estimated by the statement that Belgium, in its relations with the Kongo State, deals with a country whose area is one hundred times its own, and that of the 11,500,000 square miles of Africa all but 500,000 are European dependencies.

OCEANOGRAPHY A NEW ART

As to oceanography, a development of the nineteenth century, space only permits allusion to the work of Sigbee, in the Gulf of Mexico; Carpenter, Thomson, and Norwegian savants in the North Atlantic, and Nares and Murray

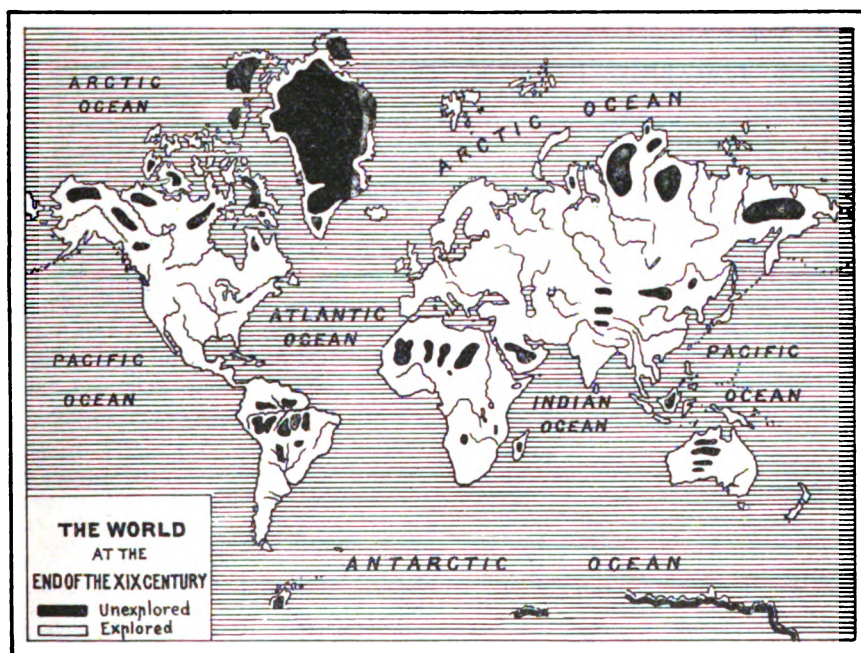
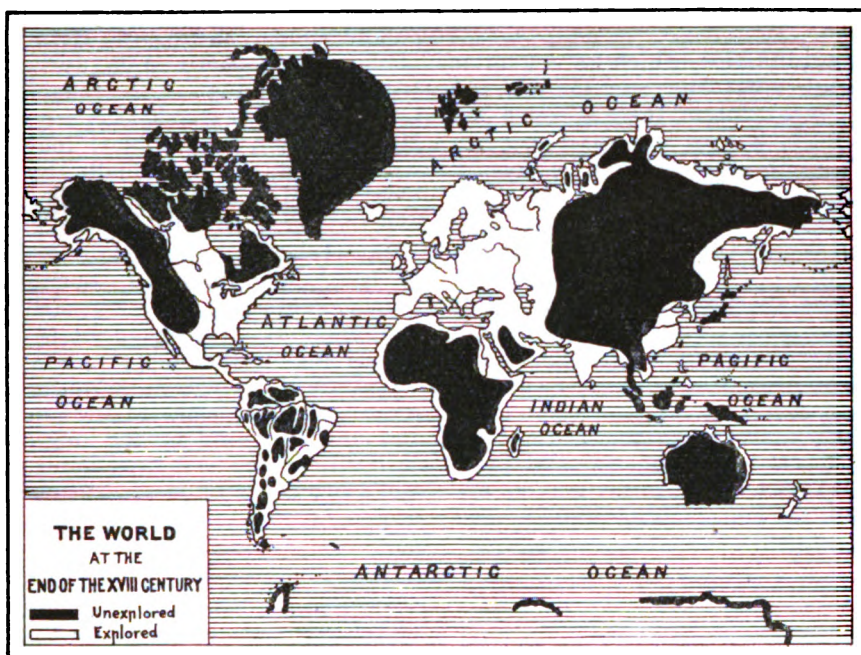
in the *Challenger* expedition. The latter work, under Murray's exposition, has outlined the main features of the oceanic world for the twentieth century to explore and chart in detail.

As to the twentieth century, it should be noted that pioneer discoveries are yielding steadily to scientific explorations. Future work will trend toward the outlining of existent and possible relations between man and his geographic environment. In this sense there remain numerous geographic problems whose satisfactory solution will tax many generations of scientific explorers. Such, for instance, are current investigations as to the acclimatization of Europeans in tropical Africa and the distribution of underground streams in the arid regions of Australia and the United States.

Reverting to pioneer discoveries, the twentieth century, despite unceasing efforts of this age, inherits an extensive legacy of unknown lands. Exploration for exploration's sake will for many years find ample scope in untraversed polar regions, Arctic and Antarctic, where the attainment of the Poles will continue to be largely the end in view.

Of unexplored areas West Australia now presents the most extensive, its vast desert having been examined only here and there along routes hundreds of miles apart.

While North America has large, vaguely known districts only in Mexico and Central America, yet South America presents many fields of great promise to adventurous men. This is especially true of the eastern slopes of the Andes in Ecuador, Colombia, and Brazil. In the western half of the drainage basin of the Amazon exploration has touched only the banks of navigable streams. Our knowledge is largely conjectural as to the extent and distribution of its forests and upland and of the existent conditions of its fauna, flora, and inhabitants.



VIRGIN FIELDS REMAINING

Even in Africa, which for a quarter of a century has engrossed the zeal and energy of explorers, there is much yet to be made known and charted. Not only is there great work to be done in the Libyan Desert and the Central Sahara, but even the country of the Taurigs, in Western Sahara, needs thorough exploration. South of Abyssinia and northwest of Lake Rudolf is almost virgin ground. The most interesting areas are the primeval forests in the basins of the Ubangi and Aruwimi. These regions invite naturalists and ethnologists to reveal to the world their fauna, flora, and ethnology, and especially to correlate information on the pygmies of Du Chaillu, Stanley, and Schweinfürth.

The new year presents such political complications as insure tremendous changes in eastern Asia during the twentieth century. As rehabilitated China concedes extended spheres of foreign influence, geographical knowledge will grow apace. Gradually the great blanks in Manchuria, Mongolia, Tibet, and Indo-China will be filled on maps of Asia. Like advances may be expected as to Arabia, Sumatra, Borneo, the Malay Peninsula, and especially the Philippine Archipelago. In the last-named region the almost untraversed islands of Mindanao, Mindora, and Palawan will soon yield to the energetic and intelligent explorer the long-hidden secrets of nature as to their fauna, flora, and capabilities of service to mankind in general and to the United States in particular.*

MEXICO OF TODAY

BY SENOR DR. DON JUAN N. NAVARRO, CONSUL-GENERAL OF
MEXICO IN NEW YORK CITY

MY object in preparing this paper is to present to the members of the National Geographic Society and to the readers of its journal some well-ascertained facts about the Mexico of today and the many natural and commercial attractions which make it one of the best places in which to invest capital with security and the prom-

ise of a speedy and splendid return. Before entering upon my subject I wish to state that my words and opinions are made on my own responsibility, and are in no sense semi-official. In speaking of my own country I can hardly be required to be impartial in my opinions, but in the statement of facts I shall endeavor to give not only my own private

* Other papers on the advance in geographical knowledge during the past one hundred years are:

"The Progress of Geography during the Nineteenth Century." By Gilbert H. Grosvenor. Appendix to the Report of the Secretary of the Smithsonian Institution for 1900.

"The Transformation of the Map (1825-1900)." By Joseph Sohn. *Scribner's Magazine*, March, 1901.

"A Century of Exploration." By Cyrus C. Adams. *The World's Work*, January, 1901.

"The Geographical Conquests of the Nineteenth Century." By Angelo Heilprin. *The N. Y. Evening Post*, January 12, 1901.

"Fields for Future Explorers." By Sir Henry M. Stanley. *Windsor Magazine*, January, 1901.

"Welche Erdgebiete sind am Schlusse des 19. Jahrhunderts noch unbekannt?" Von H. Singer, *Globus*, 2 Juni, 1900.

judgment, but the opinions of persons and newspapers who have nothing to expect or fear from Mexico.

Some years ago I knew by sight a tourist who went to Mexico City and staid there exactly a week, not knowing, of course, a single word of Spanish, and on his return home published an article on Mexico, relating all his romantic adventures in the country, among which was an attack by a band of robbers on a stage coach where that remarkable man was traveling. The captain of this band was none other than a black-eyed Señorita, who practiced the dangerous and romantic vocation of highway robbery. All those adventures were very entertaining, and their only fault was not to have any existence except in the fertile imagination of their inventor.

Within the past thirty years the means of transportation have wonderfully increased. Instead of sailing vessels and a steamer every three weeks, there are now two regular steamers every week and many "tramp" steamers, and by land we have four railroad lines connecting the two countries.

The configuration of the land of Mexico is very peculiar; low near the coasts, it ascends continually and very rapidly to the interior, until an altitude from 6,000 to 10,000 feet is reached above the sea-level, arriving at what is called the "table land."

Our capital, Mexico City, has an elevation of nearly 7,400 feet—that is to say, it is from 800 to 900 feet higher than the highest peak of Mt. Washington, which has an elevation of 6,500 feet. Although the city is only a little more than 19 degrees north of the Equator, it never experiences a tropical summer. That a light overcoat is needed in the evening at every season of the year is seldom appreciated by foreign travelers, who, under the notion of visiting a tropical country, come provided only with summer clothing, and thus often con-

tract diseases consequent upon exposure to the cold air.

Not a single navigable river traverses the whole country. This unfavorable natural condition has necessitated the building of many railroads at an enormous cost over the mountainous soil.

Our constitution is similar to that of the United States in the main points. Mexico is a federal republic, divided into States and Territories; the former ruled by their particular constitutions, and the latter directly governed by the federal authorities. The executive is appointed by popular election every four years, but as the constitution prescribes no limits for reelection, we all have had the pleasure, and, in our opinion, the good sense, of reëlecting General Diaz for the fifth term, ending on November 30, 1904.

Perhaps some persons will not deem it in accordance with republican ideas to reëlect a man so many times, but we Mexican citizens answer that if it is not in accordance with certain theoretical principles, it is in perfect conformity with that sense called *common* precisely because it is so *rare*.

The president of a republic is the attorney, elected by the citizens to administer for a certain period, under prescribed rules established by the constitution, their foreign and interior affairs. If we find a person who performs the duties imposed upon him with remarkable ability and honesty, as we Mexican citizens believe that a man of that kind cannot be very easily found, we renew our power of attorney for another four years, leaving intact the most severe maxims of republicanism.

This custom of changing as little as possible those public officers who for the performance of their duties require a certain amount of technical instruction and experience is very old in Mexico. Even in the times when political parties waged terrible war upon each other, causing frequent changes of administration,

many officers who for their competency and honesty seemed to all to be the right men in the right places were left undisturbed.

If we entertain an elevated opinion of General Diaz we only agree with what the press of every country, from Russia to Spain and from Cape Horn to Washington, declare when they assert that Mexico is one of the most prosperous and best governed countries in the world.

Our constitutional laws differ from those of the United States in denying the right to religious corporations of any denomination to possess or administer or to hold any mortgage upon real estate. In consequence the property of such corporation must be in cash or in shares of railroad, telegraph, manufacturing, mining, or some other kind of enterprise which keeps their money in constant circulation. The object of this legislation was to prevent the stagnation of real estate constantly produced by those corporations having two characteristics— indefinite duration and possession in common—not any of their members being able to dispose of any part of the property, as is the case in mercantile associations.

Another point worthy of mention is the disposition of our fundamental laws relative to marriage. Our legislators considered marriage as the corner-stone of the social edifice, and consequently they did not leave it to the legislatures of the States, but prescribed precise and ineludible rules as to its nature and form of contract.

In short, they considered marriage a civil contract constituted by the indissoluble union of a single man to a single woman, and requiring for its legal validity that it be contracted before a civil magistrate appointed for the purpose. Of course, the laws do not prevent the contracting parties from having recourse to the ministers of their religious creed, and this is the reason why in Mexico all nuptial ceremonies are double—one

of a religious and the other of a civil character.

Some lawyers say "that it is not convenient to hinder or make marriage a little difficult;" but others answer in reply, "that it is better to oblige men and women to practice the known proverb, 'Look before you leap,' or, as we say in Spanish, '*Antes que te cases, mira lo que haces*' (Before you get married, think of what you are doing)." Divorce is absolutely rejected, though legal separation is allowed, with the formalities prescribed by said laws.

The public administration of Mexico is divided into seven departments: Foreign Affairs; the Interior; Justice and Public Education; Improvements, Industry, Commerce and Colonization; Communications and Public Works; Finance and Public Credit; and War and Navy.

The Department of Foreign Affairs maintains amicable relations with all the countries of both hemispheres. Today Mexico has not a single cause of disagreement with any power or people in the world.

One of the principal objects of the Department of the Interior is to cultivate cordial relations between the Federal and State authorities. There was a time when almost every State governor conscientiously believed it to be his duty to oppose in every way the Federal Executive, and even some of them maintained a large military force, not to keep peace and give public security, but in order to resist by force, if necessary, the orders of the Federal Executive. Those narrow-minded and anarchical ideas are things of the past, and General Diaz, in his last report, relates with patriotic pleasure "that not a single State has any difficulty or displeasure with the Federal authorities or with any of its neighboring States, and that all their governors try to act in perfect accord with the Federal Executive to give an impulse to the continual progress of the

whole country." In other words, they are sufficiently enlightened to avail themselves of the reasonable liberty given by the constitution to administer their internal affairs, and remember that they are only members of that great body called the Mexican Republic, the only sovereign in the true and correct sense of the word.

The board of health is a branch of this department, and the Federal Executive and all the States devote to it special attention. In the City of Mexico a general hospital will be completed very soon, where 22 isolated pavilions have already been finished and where more than 600 patients can be commodiously, hygienically, and scientifically cared for.

The States have followed this example, and many of them have finished or have in actual construction similar institutions based upon the same scientific principles.

The efficacy of the measures taken by the board of health in regard to vaccination and the prevention of smallpox has received the amplest confirmation from experience. In 1898 an epidemic of smallpox broke out in different parts of the country and in the City of Mexico. The total number of deaths was only 78, the great majority being foreigners, who had not taken the precaution of being revaccinated.

We have another institution in excellent condition in the Federal district; that is the police. The whole force is divided in two large sections—the city or urban and the country or rural police.

The greater part of the first consist of footmen, with a small squadron of mounted police, while the second or rural police is exclusively composed of mounted men.

The distribution of the city police is, in the opinion of many natives and foreigners, perfectly organized for public protection. There is always a policeman stationed at the crossing of every

street and avenue, and misdemeanors and crimes can often be prevented and the criminals almost always caught. In general, the policemen are courteous and ready, not only to help when called, but to give any information about streets and public buildings—in a word, to be useful to everybody. The services rendered are entirely gratuitous, and many persons, especially foreigners, who with the best intention have tried to give them a voluntary reward for the recovery of lost goods, can testify that the reward has never been accepted in any form. General Diaz in his last report makes the important observation that well-made statistical tables prove that it is not criminality that has increased, but rather the efficiency of the police.

The rural police, who guard the roads of the country in general, are formed exclusively by mounted men picked from the best riders of the Republic and are mounted on splendid horses. This force, by reason of their efficiency and beautiful appearance, always attract the attention of the spectators.

Places for the correction and punishment of criminals, or penitentiaries, are being built throughout the Republic according to the systems proven best by experience, and are all founded upon the philosophical and truly Christian idea that society, when it takes hold of a criminal, does not intend to wreak vengeance on him, but to prevent him from repeating his offensive acts and to reform and convert him by every possible means into a good and honest citizen, and, at the same time, to deter others from following his example.

Let us now glance briefly over two of the most important foundations of any society, and, more especially, of a Republic—the department of justice and public education.

The Federal and State authorities are continually trying to perfect the administration of justice and to elect able and honest citizens to the judgeships. Our

constitution, like yours, decrees that the judicial authorities must be elected by popular vote, and these elections are held in the most tranquil way. My own personal opinion is against this manner of appointing judges and magistrates, as I do not think popularity is always the best qualification for the sacred duties of a judge.

The importance of public education is fully appreciated by the Federal and State authorities, and there is a complete system derived from the study by competent persons of the methods followed in foreign countries. The Federal government has not only adopted the systems considered the best, but has appointed boards of education to give to public education an impetus in the right direction and to make it uniform in the Republic.

In 1898 the number of schools in the Republic was 12,358, and of this number 6,738 were supported by Federal and State authorities, 2,953 by municipalities, and 2,667 by private parties. The average monthly attendance of pupils was 556,009. The expense of the established schools supported by the authorities amounted to \$5,980,180.72, not including the schools kept by private parties, of which I have no information. If we take as a point of comparison the cost of the schools paid by the authorities, we can calculate very approximately that \$7,000,000 were expended for public education in Mexico in that year. The number of schools for girls was 3,296; for boys, 6,813, and mixed, 2,249. This total has certainly increased since then.

The attendance of pupils increases very rapidly year after year, and I was agreeably surprised, when visiting my country after an absence of many years, to observe the wonderful results attained by our educational system. There is yet much to be done, but what has been already accomplished is truly surprising, and the board of education is con-

tinually improving and multiplying the means of instruction.

To make good teachers and to impress unity of method there are normal schools for men and women. In the normal school for women in the City of Mexico there are actually more than 1,600 girls who want to adopt the noble profession of teachers. Another excellent normal school exists in the State of Vera Cruz, and there are others in other States, but I have no data at hand concerning them.

For professional instruction there are, principally in the Federal districts, schools of jurisprudence, engineering in all its branches, commerce, agriculture, arts and trades, fine arts, one conservatory of music, and for all avocations required by the actual state of sciences and arts, and the government is continually giving to each one of them all means conducive to perfect instruction, beginning with a comfortable and hygienic building. The one, for instance, in use by the school of arts and trades for women has been extended because the actual attendance is more than 1,000.

The number of public libraries in 1898 was 130. The national library of the capital last year added to its catalogue nearly 10,000 volumes by purchase and 9,500 volumes by the donation of Mrs. Ysabel Pesado de Mier, widow of our late and lamented minister to the French Republic, Mr. Antonio de Mier y Celis, my dear friend, and one of the best and most patriotic citizens Mexico has ever produced.

The number of museums in the Republic is about 30. The National Museum of the capital, the richest of all, received last year valuable additions in the acquisition of a collection of archaeological pieces from the State of Michoacan, a collection of antique objects from the Isthmus of Tehuantepec, and fac-similes of the codices existing in the European libraries relative to our history, donated

by the Bishop of Tehuantepec and the Duc de Loubat.

The newspapers published during that year numbered 533, and of that total 153 were published in the City of Mexico, among them being daily, weekly, monthly, and quarterly journals. Very few, fortunately, were exclusively given to politics, the rest to the exposition and discussion of science, industry, commerce, agriculture, jurisprudence, medicine, political economy, mining and civil engineering, military art, etc.

These few facts, rapidly enumerated, will give some idea of the real state of the public education in Mexico.

Passing to our Department of Improvements, Commerce, and Industry, etc., our mining industry is the most important in every respect and deserves to be mentioned first. The number of mineral properties at the end of last year was 12,304, covering an area of 128,380 hectares, the equivalent of nearly 320,000 acres, besides six extensive zones in the States of Sonora, Chihuahua, and Michoacan and in the territory of Lower California, which were rented to parties under contracts made by the Executive and approved by the Federal Congress for the working of all mines that may be discovered in these tracts of land.

The yield of our silver mines in the four years from 1892 to 1896 was \$225,-247,459, or a yearly average of \$56,-311,864. During the four years 1896-1900 the production was \$274,370,157, a yearly average of \$68,592,540. Our production of gold is also increasing. From 1892-1896 it was \$14,123,876, and from 1896-1900, \$31,108,425—that is, the output more than doubled during the last four years.

In the production of silver from 1899 to 1900 there was a decline of more than two millions of dollars, but General Diaz explains the cause very satisfactorily by recalling the instability of pro-

duction, which is subject to many accidents and unforeseen circumstances that diminish or stop suddenly the output of a silver mine. Our mining enterprises are not now confined to silver and gold, but in the mining of many other metals, such as copper, antimony, lead, and mercury, large capital is employed.

Our exports of copper in the last financial year amounted to nearly ten millions of dollars. Some of our mineral-melting establishments have disposed of the following quantities:

Campaña Metalurgica Mexicana de San Luis Potosí, from December, 1896, to September 30, 1900, 332,358 tons.

Gran Fundición Central de Aguascalientes, from December, 1896, to October, 1900, 625,855 tons.

Compañía del "Boleo" baja California, in the years from 1896 to the end of 1899, 40,422 tons.

A department of vital importance to us is that of colonization. Formerly the government made some efforts in this direction, and we now have 29 colonies in steady progress, 13 established directly by the government and 16 by private companies. Experience has taught us, however, that it is better to leave this matter to private enterprises, and the only positive aid given by the government is the tranquillity, security, and incessant and rapid progress of the whole Republic. When these advantageous conditions become universally known the current of immigration will flow into Mexico, where nobody can starve, where the poorest, with some exertion, can arrive at a comfortable situation—the middle class become rich and the rich can increase their capital by millions; and all this with a beautiful climate, salubrious everywhere, except on the coasts, and among a peaceful, industrious people, who have well earned the reputation of being one of the most courteous and hospitable upon the face of the earth.

(To be continued in the May number)

GEOGRAPHIC NOTES

OFFICIAL INFORMATION RELATING TO THE PHILIPPINES

THE State Department has recently published three handsome volumes on the Philippine Islands. The first two volumes are a history of Spanish work in the archipelago, with a cyclopedic statement of the resources of the islands. The different peoples, their means of livelihood, their customs, and character are sympathetically portrayed by the editors, Rev. José Algué and the Jesuit Fathers of Manila. The third volume is an atlas of about 60 colored maps. This atlas is the most comprehensive statement of what is known of the geography of the islands ever published. The collection of the material has been the work of generations of the Jesuits, but under the Spanish régime want of money had prevented the publication of the mass of facts obtained. The map-makers of the U. S. Coast and Geodetic Survey have systematized the material which the Jesuits supplied. Volumes I and II are in Spanish and illustrated with very good pictures. The set of three volumes may be obtained from the State Department by the payment of \$20.

The Reports of the Taft Philippine Commission, which form a volume of 600 pages, may now be obtained from the State Department gratis.

The War Department has recently issued a large map of Luzon on the scale of 10 miles to the inch. It embodies all the latest information received by the department from its officers and agents in the islands. The department has also printed a third and revised edition of the large map of the archipelago based on the map of Montero Y. Gay, first published in Madrid.

The latest edition of the "Progress Map of Signal Corps Telegraph Lines

and Cables" in the Philippines shows all lines laid by the corps up to February 1, 1901. The lower half of Luzon is now covered with a network of wire, while two trunk lines penetrate to the extreme north end of the island. The islands of Panay, Cebu, Negros, Leyte, and Bohol each have several hundreds of miles of wire, constructed by the corps, and are connected by military cables. There are now in operation in the islands 9,000 miles of wire and 400 miles of cable.

These maps may be obtained by responsible persons gratis.

THE CENSUS OF INDIA

THE census of India, taken March 1, 1901, gives the population of that vast country as 294,266,000, an actual increase of only 1.49 per cent during ten years, while during the preceding decade the increase was 11.2 per cent.

The population in 1891 was 287,717,000, but as certain tracts are included in the census of 1901 that were not enumerated in 1891, the net increase is only 4,283,069. In numbers India has thus added to her population less than one-third of what the United States have gained, though the former has four times the population of the latter—an increase of four millions as against thirteen millions for the United States.

The reasons of this small increase in the figures are two: first, the terrible ravages of the plague for four consecutive years in the Bombay Presidency and the two great famines of 1896-'97 and 1899-1900, and, second, the greater accuracy with which the work of the census has been performed.

The population of British India has increased considerably, while in the Native States it has fallen off. British

India now numbers 231,085,000 against 221,266,000 in 1891, and the Native States, 63,181,000 against 66,050,000 in 1891. It is yet too early to analyze the returns for the Native States, but there would appear to be an excessive decline in the birth rate.

The following table gives the population in thousands, the third column showing the percentage of increase or decrease:

British Territory.	1901.	1891.	Percent- age.
Ajmere.....	476	542	— 12.17
Marwar.....			
Assam.....	6,122	5,433	+ 12.67
Bengal.....	74,713	71,346	+ 4.72
Berar.....	1,491	2,897	— 4.99
Bombay.....	15,330	15,957	— 3.93
Sind.....	3,212	2,871	+ 11.88
Aden.....	41	44	— 6.48
Upper Burma.....	3,749	3,362	+ 14.49
Lower Burma.....	5,371	4,408	+ 21.84
Central provinces.....	9,845	10,784	— 8.71
Coorg.....	170	173	+ 4.28
Madras.....	38,208	35,630	+ 7.24
Northwest provinces.....	34,812	34,253	+ 1.63
Oudh.....	12,884	12,650	+ 2.40
Punjab.....	22,449	20,766	+ 7.58
Baluchistan.....	810	*	*
Andamans.....	24	15	+ 56.95
Total.....	231,085	221,266	+ 4.44
Native States.			
Haidarabad.....	11,174	11,537	— 3.14
Baroda.....	1,956	2,415	— 19.23
Mysore.....	5,538	4,943	+ 12.
Kashmir.....	2,906	2,543	+ 14.24
Rajputana.....	9,841	12,016	— 18.1
Central India.....	8,501	10,318	— 17.5
Bombay.....	6,891	8,059	— 14.49
Madras.....	4,190	3,700	+ 13.23
Central provinces.....	1,983	2,160	— 8.19
Bengal.....	3,735	3,296	+ 13.33
Northwest provinces.....	799	792	+ .91
Punjab.....	4,438	4,263	+ 4.12
Burma.....	1,228	*	*
Total Native States.....	63,181	66,050	— 4.34
Total all India.....	294,266	287,317	+ 2.42

* No comparison possible.

GEN. FOSTER ON MEXICO

HON. JOHN W. FOSTER has been contributing to the *New York Tribune* a series of very pointed papers on the condition of Mexico of today. General Foster began his distinguished diplomatic career in 1873 as the United States Minister to Mexico, where he represented his nation for seven years. Until this winter he had not revisited the country in the twenty years since his recall. In the meantime he has been the United States minister to the courts of Russia and Spain, and held the highest diplomatic office in the United States, that of Secretary of State.

Instead of geographic isolation, Mexico is now bound to the United States by the iron ties of four railroads, while many steamship lines ply between Vera Cruz and foreign ports. Security of life and property is now assured. The evidences of progress and prosperity are seen on every hand. Mexico, the capital city, has doubled in numbers, and in its conveniences and wealth-bringing attractions may vie with the great cities of the continent.

In its foreign relations Mexico has risen to a position of dignity and gained the respect of all nations. "A marked feature of the recent diplomatic relations of Mexico has been the extension of these relations to the Far East. Several years ago a treaty of amity and commerce was effected with Japan, and missions are now maintained at the two capitals of both governments. Last year a similar treaty of a very liberal character was signed at Washington by the Mexican Ambassador and the Chinese Minister. By it Chinese laborers are admitted into the country, and they are already coming, especially to the Pacific Coast, in considerable numbers, and by their industrious and persistent habits are making themselves felt as an important element of the country."

To the able management of affairs by

President Diaz Mr. Foster attributed the prosperity of the country. The result of the President's good judgment is especially evident in the present confidence in the financial condition of the country, both official and private. "The revenues which before (the election of General Diaz) had been barely \$20,000,000 annually, soon doubled, then trebled, and within ten years had increased more than sixfold, reaching as high as \$120,000,000."

This increase made possible the abandonment of the old system of taxation of goods passing from state to state and of taxes collected at the city gates on all articles of consumption entering the city. By this reduction in the branches of taxation the national revenues have diminished to \$60,000,000, which is sufficient for all the current needs of the government, and yields a surplus to be expended for special purposes.

The entire indebtedness of the Republic amounts to about \$177,178,000, borne by about 13,570,000 souls. Mexico's debt *per capita* is thus only \$13, while that of Canada is \$71.

EXPLORATION DURING VICTORIA'S REIGN

A PERUSAL of Gen. A. W. Greely's able article shows that nearly all the enormous advances in geographic knowledge during the past 100 years were made during Queen Victoria's reign. In 1837 Livingstone was attending medical and Greek classes in Glasgow, and Stanley had not been born. Victoria had reigned 16 years before McClure, in 1853, attained the Northwest Passage, and 43 years before Nordenskjöld, in 1880, solved the problem of the Northeast Passage. Sir James Ross, Wilkes, Weddell, and D'Urville all won their Antarctic laurels within her reign. Australia was not crossed from north to south by Stuart till

1862, 25 years after her accession, and from east to west by Colonel Warburton till 1873, 36 years after her accession. Huc, the explorer of Tibet; Pumpelly and Richthofen, pioneers in China, and Nevelskoy, who ascended the Amur from the sea, gained their fame within Victoria's reign. Frémont, Powell, Dall—names illustrious in the exploration of the American continent—also did their work since 1837.

From her accession Victoria was Patron of the Royal Geographical Society, and to her encouragement are due many of the great enterprises planned and successfully carried out by the Society. She was ready also to reward the work of British explorers. James Ross, Leopold McClintock, John Franklin, Samuel Baker, Robert Schomburgk, Henry M. Stanley, and others, she knighted in recognition of their achievements. The Founder's Medal and the Patron's Medal, awarded annually by the Royal Geographical Society, were granted by her.

PHENOMENAL INCREASE IN POPULATION OF ITALY

THE population of Italy has practically doubled in the last twenty-years, a rate of increase that surpasses that of all nations of Europe and even the United States. This, too, notwithstanding the burdens of excessive taxation, that would tend to diminish the birth rate. The last census was taken twenty years ago, in 1881, and showed a population of 21,000,000. According to the census taken early this year the population now numbers 35,000,000. It is safe to estimate the number of emigrants during the twenty years as at least 5,000,000, so that the increase by birth has been about 20,000,000. It has taken the United States thirty years, aided by 12,000,000 immigrants, to double its numbers.

U. S. COAST AND GEODETIC SURVEY

FIFTEEN young Filipinos will soon be selected by civil service examinations in Manila as aids in the U. S. Coast and Geodetic Survey. They will probably be brought to the United States for a preliminary training at the head office in Washington before being assigned to active work in charting the rivers and harbors of the islands. They will be paid \$720 a year, a very generous salary in the Philippines, and clever young Filipinos will undoubtedly be secured. The experiment, initiated by Dr. O. H. Tittmann, superintendent of the Survey, is of great importance, as it is the first step to interest, train, and identify the young Filipino in the scientific development of his country.

The coast of southeastern Alaska has been well charted by parties of the Survey during the past several years, but the approaches to this section have remained unmapped. This summer the *Pathfinder* and *McArthur*, in charge respectively of J. J. Gilbert and F. Westdale, will carry survey parties to these channels and soundings will be taken to accurately determine them. A large party will work in Prince William Sound, while several vessels will carry other men westward to tackle the difficult problem of charting the many channels between the Fox Islands of the Aleutian archipelago.

GLACIAL ACTION IN AUSTRALIA

THE evidences of glacial action in Australia during Permo-Carboniferous times are discussed by Professor Penck in the *Zeitschrift* of the Berlin Gesellschaft für Erdkunde, and compared with traces of simultaneous action in India and South Africa. The hypothesis of a shifting of the South

Pole to a central point on the tropic of Capricorn, in longitude 86° E., does not satisfactorily account for the geological facts and the existence of glacial conditions over such an enormous area. Professor Penck is quoted in *Nature* as saying that the appearances ascribed to ice action present in each case certain features not characteristic of ordinary glacial deposits; the deposits are stratified and the pebbles are faceted in the manner first described by Wynne. He further observes that the Gondwana beds, always closely associated with these boulder deposits, have lately been found in the Argentine Republic, and he compares the bedding and faceting with conditions induced by pressure observed in the Nagelfluh and in certain localities near Vienna. While many of the observed facts appear to indicate glacial action, still he thinks that these special points demand investigation.

THE NORTHWEST BOUNDARY

IT is well known that the boundary between the British possessions in North America and the United States, from the Lake of the Woods westward to the Pacific Ocean, was long a matter of dispute. Every one knows, too, that after the controversy had given rise to threats of war the 49th parallel was agreed upon by both governments as the dividing line. So, as represented upon the map, the whole question seems settled. Nevertheless there are many persons along this line to whom nothing indicates whether they are living in the territory of the King or of the Union. During 1872-'76 a joint commission erected 388 boundary monuments along the line about two miles apart, but they hardly proceeded farther west than the Rocky Mountains, and left the 410 miles between the mountains and the Strait of Georgia almost unmarked. To survey

and mark out this far northwest boundary an expedition is now being organized by the Geological Survey, at the direction of the State Department. It is probable that the Canadian authorities will coöperate with the Americans in definitely indicating the exact boundary. Much of this region is still without roads and trails. The work will be difficult, as it must be prosecuted in part through the wildest region of the Rockies and Cascades, where impassable streams and lofty cliffs make direct advance impossible. The necessary surveys will require three or four years.

After the work is completed it must be approved by a treaty between the British and American governments, describing in detail the location of this part of the northwest boundary and the monuments by which it is indicated.

Mr. E. C. Barnard, the well-known topographer of the U. S. Geological Survey, will run the line, in coöperation with Mr. C. H. Sinclair, of the Coast and Geodetic Survey. Messrs. Bailey Willis, F. L. Ransom, and G. O. Smith accompany the party as geologists to study the geology of the country in the vicinity of the dividing line.

SUSPENSION RAILROAD IN GERMANY

A SUSPENSION railroad of novel construction has recently been opened at Elberfeld, in Germany. It is about eight miles in length and runs through the towns of Barmen and Elberfeld, following the course of the river Wupper. The up-and-down lines have only a single rail apiece, supported by an iron framework of a kind hitherto unknown in railroad engineering. Each car hangs from two supports 25 feet apart, fitted with double wheels, which run upon the overhead rail. These supports are so shaped that it is believed to be impossible for them to leave the

line, even though an axle or a wheel should break.

The motive power is electricity, supplied by a wire attached to the rail. Each pair of wheels is operated by an electric motor controlled by a motorman in the front car. The railroad is the invention of the late Herr Eugene Langer, of Cologne, who died in 1895. The chief advantage claimed is cheapness of construction, for the line can be built over public roads and rivers, where no ground need be purchased.

CAPE TO CAIRO TELEGRAPH

WORK is progressing on the telegraph line from Cairo to the Cape, although little has been heard about it of late, owing to the war in South Africa and the great distance from civilization the engineers have penetrated. The line of poles and wire now stretches 3,000 miles up from the Cape to a point 50 miles north of the town of Kasanga, on the shore of Tanganyika, in German East Africa. Only 1,200 miles remain between Kasanga and the southern end of the Egyptian telegraph line. This last link will be traversed more easily, as the apparatus and supplies can be brought by water instead of by native porters. Porters have to be continually engaged, as the men refuse to go more than a few hundred miles from their homes. Horses, mules, and cattle cannot be employed, as they cannot survive the bite of the tsetse fly.

The country just traversed between Lake Tanganyika and Salisbury is the hardest bit of ground to be met with, for it is mountainous, heavily wooded, and malarious. Mr. E. S. Grogan, the explorer, reports having seen engineers supervising the work from litters while racked with fever and the thermometer standing at 104°.

The rinderpest and the war with the

Matabeles which followed also delayed the work. The Matabeles misunderstood the white man's motive in killing their apparently well cattle, but which were really infected with the disease, and in revenge tore down miles of telegraph poles and melted his wire into bullets, which they fired back at him. In this war \$200,000 worth of the company's supplies were destroyed.

They have had less trouble than was expected from wild animals; sometimes, to be sure, elephants have knocked down the poles, and once a lion helped himself to several natives before he was killed.

GERMAN SUBMARINE CABLE SYSTEM

A VAST system of submarine cables is being projected by Germany. In October, 1900, a line was opened connecting Kiaochau with Chifu, and the southern end is now being rapidly extended to Shanghai and Canton. Later a branch cable will be laid from Kiaochau to Nagasaki to connect with the American Pacific cable, which is destined to be soon constructed, while the main cable will be continued to Manila, Sumatra, Borneo, New Guinea, and the Caroline Islands. From the Azores a line will be laid southward to the Cape Verde Islands, thence down the Atlantic to the South American continent to Bahia, Rio de Janeiro, and Montevideo.

On the other side of the Atlantic a German cable will unite Morocco, Guinea, the Kameruns, and German Southwest Africa. When the construction of the system has been completed, the German Emperor will be able to communicate with his possessions in every quarter of the world independent of English lines. His messages will cross the Pacific and American continent on American cables and the Atlantic on the German New York-Azores-Emden line, completed last year.

GREAT BRITAIN IN THE YANGTZE VALLEY

NOTHING is more noticeable than the decay of British influence in southern China during the last five years. It is not merely that British influence has declined, but that the influence of other powers has largely developed in a region supposed to be distinctively the British sphere. Says the Shanghai correspondent of the *Times* in a recent letter: "The Yangtze is steadily growing less and less English and more and more international." He fortifies this statement by discouraging facts observed in Shanghai and Hankau, "the key of the Upper Yangtze." He says: "The one advantage we still possess over the other powers in the Yangtze Valley is the confidence and good will of the better classes among the peoples and officials of central China." But he concludes: "British influence in the Yangtze Valley, as in the rest of China, is, relatively to that of other nations, not an increasing but a steadily and rapidly diminishing quantity."

Sir Archibald Geikie, who retired in March from the head of the British Geological Survey, was born in Edinburgh sixty-six years ago. His whole life has been spent in geologic work. When barely thirty he was appointed Director of the Scottish Geological Survey, and later held the chair of geology in Edinburgh University. In 1881 he was chosen Director General of the Geological Survey of the United Kingdom, and ten years later was knighted in appreciation of his work. James Geikie, whose name is perhaps better known in America, is the younger brother of Sir Archibald. J. J. Harris Teall, the well-known writer on geological subjects, has succeeded Sir Archibald Geikie as Director General of the British Geological Survey.

An Austro-Hungarian floating exposition leaves Trieste in May for a fifteen months' voyage around the world. It is deemed impracticable for more than one ship to take part in the enterprise, as the trip is an experiment. New York, San Francisco, Yokohama, Shanghai, Singapore, Batavia, Calcutta, Madras, Aden, and Suez will be visited. Firms that send exhibits are charged \$1,000 for each person and \$200 for every cubic meter of space or per ton weight.

U. S. Weather Bureau.—After July of this year the number of forecast districts of the U. S. Weather Bureau will be increased by the addition of Boston, Galveston, and Denver as centers of new districts. The United States is now divided into four districts, each with a center, at which the forecast for that particular district is made. These centers are San Francisco, Portland, Oregon, Chicago, and Washington. By the division into smaller districts greater efficiency will be attained.

An Earthquake Occurred in Spain on February 10, which did considerable damage in Grazalema, a town of 10,000 inhabitants situated in a hilly district of the province of Cadiz, about 70 kilometers, nearly due north, from Gibraltar. Several large buildings, factories, and mills, as well as the church of St. Joseph, were severely injured. Señor Augusto Arcimis, writing to *Nature* from the Central Meteorological Institute of Madrid, says that the body of water that provided motive power for the machinery in one of the factories has disappeared.

British Yukon Telegraph.—It has been stated with apparent certainty that the two British parties constructing the telegraph line from Quesnelle to Atlin, who are working toward each other, the first from Quesnelle northward and the second from Atlin southward, at the halfway point, instead of meeting, found

themselves on opposite sides of an impassable mountain range, sixty miles across. Atlin connects with the United States lines uniting Cape Nome, Dawson, and the military posts of Alaska, while from Quesnelle wires run to the great continental systems.

In Jamaica an African Language is still spoken among the Maroons, the descendants of wild negroes who escaped from slavery during the early days of the slave trade. According to Maj. J. W. Powell, of the Bureau of American Ethnology, this language belongs to the Kongo region. The Maroons of Jamaica seem to be in a barbarous or semi-civilized condition, resembling in this respect our North American Indians, and, like the Amerinds, they are confined to reservations, where they still preserve many of the customs and traditions of their savage ancestors.

The Recent Census of Vienna shows that in Austria, as in Germany, there is taking place a very rapid increase in city populations, due in large part to immigration from the rural districts. Vienna has now 1,635,647 inhabitants, and has increased in population during the past ten years 21.9 per cent. Vienna now ranks fourth among the European capitals, London, Paris, and Berlin exceeding her. London and Berlin are increasing at a faster rate. Of American cities, New York and Chicago outrank Vienna in numbers, and each is increasing more rapidly—New York 37.8 per cent, and Chicago 54.4 per cent, in ten years.

The U. S. Board on Geographic Names held no meeting during March. By act of Congress a second edition is being printed of the volume containing all the decisions of the Board up to January 1, 1900. Copies of the report may be obtained by applying to Marcus Baker, secretary of the Board, U. S. Geological Survey, Washington, D. C.

GEOGRAPHIC LITERATURE

Newest England. By Henry Demarest Lloyd. Illustrated. 8vo., pp. 387. New York: Doubleday and Page.

Mr. Lloyd ably traces the development of those forces in New Zealand which have given pensions to the old and have made government monopolies of life and accident insurance, and also of railways and telegraphs. He describes the government and people as "the least bad this side of Mars"—*i. e.*, they are not perfect, but no others are as good. The relatively enormous public debt, \$300 for each man, woman, or child, a *per capita* debt which in this country would amount to twenty-two billion dollars, and the consequently decreasing birth rate are two grave facts which Mr. Lloyd overlooks.

An Old Indian Village. By Johan August Udden. Augustana Library Publications, No. 2. Rock Island, Illinois, 1900.

Although the author of this interesting brochure lays no claim to special skill in archæology, his work may well serve as a model to local archæologists throughout the great area covered by the Mississippi drainage system.

The scene of the explorations conducted by Professor Udden at intervals during seven years from 1881 is Paint Creek valley, a mile and a half south of Smoky Hill River, in McPherson County, Kansas. The village remains consisted of fifteen low circular mounds from twenty to twenty-five feet in diameter, without particular order of arrangement and covering an area of about twenty acres. The average height of the mounds is about two feet, while some rise only very slightly above the surface of the prairie.

Excavation revealed axes, hammers,

polishers, metates, manos, flakers, pipes, knives, and scrapers of stone, and awls, hoes, beads, gouges, and other objects of bone. Bones of numerous animals, fishes, and the wild turkey, as well as the valves of fresh-water clams, were also found during the excavations, indicating that the former occupants of the site gained a livelihood by hunting as well as by agriculture.

Perhaps the most interesting object unearthed from the Paint Creek village—certainly the most interesting from the historical and geographic points of view—is the piece of chain mail illustrated in the volume, but unfortunately since lost. The definite origin of this relic of early Caucasian exploration is not known, but as the field of Professor Udden's researches was unquestionably a part of the Province of Quivira, which the famous expedition of Francisco Vasquez Coronado penetrated in 1541, and which led to similar expeditions into the same locality during the succeeding half century, the relic is in all likelihood of Spanish origin.

The Province of Quivira was inhabited in the sixteenth century by the Wichita Indians, who later occupied an extensive area southward in the present Oklahoma, whence the name of the Wichita Mountains and of Washita River. They were the only Indians of the plains who lived in grass houses (such as Coronado's chroniclers describe as having been seen in the Quivira region), the Pawnees occupying earth lodges, and other plains tribes portable tipis of buffalo hide. We may therefore assume that the Paint Creek village was inhabited by the corn-raising and buffalo-hunting Wichitas, as the relics would seem to show, and probably during the Coronado period, or at any rate during the time of one of the immediately succeeding Spanish expedi-

tions from New Mexico, as the fragment of chain mail tends to prove.

Altogether Professor Udden's work is worthy of high praise. It is regrettable that "this will be his last as well as his first paper bearing on topics of this kind."

F. W. HODGE.

The Romance of the Earth. By A. W. Bickerton. Illustrated. Small 8vo, pp. 181. New York: The Macmillan Co., 1900. \$0.80.

As indicated by the title, the author aims to describe the past and present of the earth in the form of a story. The idea and its execution are capital. The author naturally has not adhered strictly to the limits of known science. Where human knowledge can throw no light, he permits himself "to speculate, to make deductions from the accepted laws of nature" in order that no chapters in the romance may be missing. The book is instructive and interesting, and espe-

cially valuable to stimulate younger minds to learn more of the great "romance of the earth."

The Philippines—The War and the People. By Albert G. Robinson. Pp. 407. New York. McClure, Phillips & Co. 1901.

The volume consists of letters written by Mr Robinson to the New York *Evening Post* while he was staff correspondent for that journal in the Philippines. Mr Robinson is inclined to believe "that development in the islands would be impossible without the patient, submissive, industrious Chinaman," who is "a sort of necessary evil." The book contains much valuable information about the islands and their people, though it is doubtful if many Americans will agree with the author's pro-Filipino tendencies. Specially interesting chapters are, "The Moros of Mindanao" and "The Moros of Sulu."

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY

Popular Meetings.*

March 1, 1901.—President Graham Bell in the chair. Mr. Gilson Willetts delivered an illustrated address, "The Recent Famine in India."

March 15, 1901.—Vice-President McGee in the chair. Mr. H. L. Bridgman, Secretary of the Peary Arctic Club, and Dr. Frederic A. Cook, of the Belgian Antarctic Expedition, delivered illustrated addresses on "The Two Ends of the Earth—Peary and the North Pole, and The Cruise of the *Belgica* in the Antarctica."

March 29, 1901.—President Graham Bell in the chair. Mr. Alexander Hume Ford delivered an illustrated address, "The Railways and Waterways of the Russian Empire."

* The proceedings of the technical meetings during March will appear in the May number.

Afternoon Meetings.

March 5, 1901.—President Graham Bell in the chair. Talcott Williams, LL. D., delivered an illustrated address, "Western Asia."

March 12, 1901.—President Graham Bell in the chair. Hon. John Barrett delivered an illustrated address, "Eastern Asia—China."

March 22, 1901.—President Graham Bell in the chair. Prof. H. Morse Stephens, of Cornell University, delivered an address, "Southern Asia—India."

March 26, 1901.—President Graham Bell in the chair. Prof. Edwin A. Grosvenor, of Amherst College, delivered an illustrated address, "Northern Asia—Siberia."

April 2, 1901.—President Graham Bell in the chair. Vice-President McGee delivered an illustrated address, "Asia—The Cradle of Humanity."

Announcements.

THE ANNUAL RECEPTION OF THE SOCIETY will be held on Friday evening, April 12, in the parlors of the Arlington hotel. Mr. Paul Du Chaillu will be the guest of honor of the Society and will give some reminiscences of his travels.

A REGULAR MEETING OF THE SOCIETY will be held in the large hall of the Cosmos Club at eight o'clock Friday evening, April 19. All members resident in Washington are urged to attend, as important proposed changes in the by-laws, submitted and recommended by the Board of Managers, will be acted upon.

Object of Proposed Change in By-laws.

The Board of Managers submits and recommends to the Society important amendments to the by-laws. The proposed changes are so numerous that, for the sake of simplicity, the Board offers an entire set of revised by-laws to replace the existing by-laws. Members who wish to note in detail the modifications proposed can do so by comparing the draft which follows with the existing by-laws as printed in the MAGAZINE, Vol. IX, pages 414-416. The general tenor of the changes is set forth in the following paragraphs:

In an address read to the Board of Managers June 1, 1900, and printed in the Magazine for October (Vol. XI, pages 401-408), President Bell advocated various changes in the policy of the Society, for the purpose of making its character more truly national. The revised by-laws now offered embody one of the more radical of these changes.

At the present time the Society has *active members*, residing chiefly in the District of Columbia, and *corresponding members*, residing chiefly in other parts of the United States. The dues of active members are five dollars, of corresponding members two dollars. Both classes receive the Magazine; active members have in addition various other privileges, including that of attending lectures. Thus constituted the Society is not national in its active membership, but only through its corresponding membership. It is now proposed (1) to merge the grades of corresponding member and active member into the single grade of *member*, (2) to fix the dues for all at two dollars, (3) to treat lecture courses, whether in Washington or elsewhere, as local privileges, to be paid for by those who are benefited.

The proposed by-laws include many minor changes which seem to the Board desirable if the general change in organization be adopted. The more important of these are (1) the enlargement of the Board of Managers by the

addition of members not residing in the District; (2) the creation of an Executive Committee for the transaction of current business; (3) the restoration of the fiscal year to coincidence with the calendar year; (4) the omission of section 8 of article IV, with reference to Managers who are continuously absent from meetings of the Board.

They include also a number of changes not specially related to the general change in organization. The more important of these are (1) the substitution of the single office of Secretary for the two offices of Recording Secretary and Corresponding Secretary; (2) the omission of the requirement that the Secretary and Treasurer be selected from the Board of Managers; (3) the making more stringent the rules with respect to arrearage of dues; (4) the reduction of the quorum of the Society from 25 to 20; (5) the provision that official notice of proposed amendments to the by-laws may be given through the Magazine.

The amendments will come up for action at the regular meeting to be held April 19.

A. J. HENRY, *Secretary*.

Proposed By-laws.

ARTICLE I.—*Name*.

The name of this Society is *The National Geographic Society*.

ARTICLE II.—*Object*.

The object of the Society is the increase and diffusion of geographic knowledge.

ARTICLE III.—*Membership*.

SECTION 1. The Society shall consist of members and honorary members.

SEC. 2. Members shall be persons interested in geographic science.

SEC. 3. Honorary members shall be persons who have attained eminence by the promotion of geographic science. They shall not be members of the corporation, nor shall they vote or hold office.

SEC. 4. The election of members and honorary members shall be entrusted to the Board of Managers.

ARTICLE IV.—*Officers*.

SECTION 1.—The administration of the Society shall be entrusted to a Board of Managers composed of twenty-four members, eight of whom shall be elected by the Society at each annual meeting, to serve for three years, or until their successors are elected. Of the eight members elected at each annual meeting, not less than four nor more than six shall

be residents of the District of Columbia. A majority of the votes cast shall be necessary for election.

SEC. 2. The Board of Managers shall elect annually from their own number a President and a Vice-President, and shall elect annually a Treasurer and a Secretary.

SEC. 3. The President shall preside at the meetings of the Society and of the Board of Managers, or may delegate this duty. The President and the Secretary shall sign all written contracts and obligations of the Society.

SEC. 4. In the absence of the President his duties shall devolve on the Vice-President.

SEC. 5. The Treasurer shall have charge of the funds of the Society, under the direction of the Board of Managers, and shall make collections and disbursements and render an annual report, and his accounts shall be audited by a committee of the Society, not members of the Board, annually and at such other times as the Board may direct.

SEC. 6. The Secretary shall record the proceedings of the Society and of the Board of Managers, conduct correspondence, and make an annual report.

SEC. 7. The Board of Managers shall fill vacancies arising in the Board.

SEC. 8. All officers shall serve until their successors are chosen.

ARTICLE V.—*Committees.*

SECTION 1. The Board of Managers shall select annually from its own number an Executive Committee.

SEC. 2. There shall be standing committees on Publications, Communications, Admissions, Research, and Finance, whose chairmen shall be members of the Board of Managers. These committees shall be appointed immediately after the annual election of the President to serve until their successors are designated.

SEC. 3. The committees of the Society and of the Board of Managers shall be appointed by the President, except when otherwise provided. The President shall be a member *ex officio* of every committee.

ARTICLE VI.—*Finances.*

SECTION 1. The fiscal year of the Society shall begin on the first day of January.

SEC. 2. The annual dues of members shall be two dollars, payable in January.

SEC. 3. Annual dues may be commuted and life membership acquired by the payment at one time of fifty dollars.

SEC. 4. Members whose dues remain unpaid on March 1 shall be notified by the Treasurer that unless the dues are paid within one month they will be in arrears and not entitled to vote at the annual meeting, to receive the

publications of the Society, or to purchase lecture tickets on members' terms. Members one year in arrears shall, after formal notification, be regarded as having withdrawn from the Society.

SEC. 5. The funds of the Society may be invested and loans may be negotiated in the interests of the Society, and any other financial business germane to the purposes of the Society may be transacted by the Board of Managers.

ARTICLE VII.—*Meetings.*

SECTION 1. Regular meetings of the Society shall be held on alternate Fridays from November until May.

SEC. 2. Special meetings may be ordered by the Board of Managers or called by the President.

SEC. 3. The annual meeting shall be held in the District of Columbia on the second Friday in January.

SEC. 4. Twenty members shall constitute a quorum.

SEC. 5. Regular meetings of the Board of Managers shall be held on the same days as the regular meetings of the Society; special meetings may be held at the call of the President or on notice signed by five members of the Board: *Provided*, That for any of its own meetings the Board may substitute meetings of the Executive Committee.

SEC. 6. Lectures and lecture courses may be provided by the Board of Managers. Free admission to such lectures shall not be a prerogative of membership, but tickets shall be sold to members on more favorable terms than to non-members: *Provided*, That each life member who acquired life membership prior to the year 1901 shall be entitled to two admissions to each lecture and course.

ARTICLE VIII.—*Publications.*

The Society shall publish a journal or periodical under the title THE NATIONAL GEOGRAPHIC MAGAZINE, which shall be sent to all members of the Society not in arrears, and may be placed on sale.

ARTICLE IX.—*Amendments.*

These By-Laws may be amended by a two-thirds vote of the members present at any regular meeting, provided the proposed amendments are reported by the Board of Managers, and provided that notice thereof has been sent to all members of the Society not less than ten nor more than sixty days before the meeting. The publication of proposed amendments in THE NATIONAL GEOGRAPHIC MAGAZINE shall be deemed a notice within the meaning of this article.



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THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XII

AUGUST, 1901

No. 8

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ceeding term. In Paraguay the president is chosen by a direct vote of the people for four years, and both president and vice-president are non-eligible for eight years. Brazil, the last of these countries to assume a republican form of government, and profiting by the experience of its neighbors, provided for the election of its president by a direct vote of the people for four years, and made him ineligible for reelection. Its constitution also contains a provision that the candidates must not be related by blood or marriage to the outgoing president or vice-president in the first or second degree. In Venezuela the choice of the chief executive is somewhat complicated. Congress consists of two houses, the representatives being elected for two years by the people, and the senators for four years by the state legislatures. A federal council of nineteen members is chosen every two years by the congress, who elects a presiding officer from their own number, and he is president of the republic for the two years. Neither the president nor council can be reelected for the next term.

When these countries declared their independence and first essayed the practice of republican government, they soon found that the greatest danger to their institutions arose from the disposition of the chief executives to prolong their power by continuance in office, in violation of the constitutional provision. Iturbide, the first president of Mexico, betrayed his trust, declared himself emperor, and dissolved the congress by force, precipitating the country into revolution and paying the penalty with his life.

Simon Bolívar, the most renowned of the Spanish-American patriots and the one who did most to achieve the independence of the South American countries, marked his entire career by overriding their constitutional provisions as to the executive and by assuming dictatorial powers. As early as 1813 he

captured Caracas from the Spaniards and set up the government of Venezuela, but he at once declared himself dictator, established a court and body-guard, and assumed royal dignities. He soon became unpopular, met with reverses, and had to flee the country. Returning after some years, he led the insurrectionary movement which gave final independence to Venezuela and Colombia, and thence went to the aid of the struggling Peruvian patriots, achieved their independence, and was made dictator of that country. Having failed in his effort to secure a provision in the constitution making himself president for life, he returned to Colombia, where he was chosen president of the united states of Colombia and Venezuela. Seeking in vain to secure a constitutional provision giving him practically absolute power, he declared himself dictator. Being suspected of desiring to make himself a king, he lost his popularity, was driven from power, and died in retirement. He was called "the Washington of South America," but beyond his gallant services in securing the independence of the northern states of South America, he had little in common with Washington in his conduct or character. The example of the latter was lost upon him when he rejected the offer of the American army to make him king, and when, after having enjoyed the free suffrages of his countrymen as President, he voluntarily laid down the great office and retired to private life.

If the history of the Latin American republics is carefully examined it will be seen that the cause of most of the revolutions which have darkened its pages, decimated their population, and retarded their development has had its origin in the efforts of the public men of those countries to continue themselves in power or to attain the presidency by other than peaceful and constitutional methods. With rare excep-

tions the revolutions and bloody contests of these republics for the past three-quarters of a century have been purely of a personal character, the struggles of the partisans of one aspiring individual against the partisans of his ambitious opponent. One of the most notable exceptions was the war of reform waged in Mexico for ten years, beginning in 1857, by the liberal party against the united power of the clergy and Emperor Napoleon. That was a heroic war, involving great principles of government.

I can probably best illustrate the historical fact of this personal cause of revolutions by a very brief sketch of the experience of two of these republics—one the most revolutionary and the other the most conservative and prosperous of the Spanish-American countries.

Venezuela, on its separation from Colombia in 1831, chose Paez president. He filled out his term, and in 1835 sought by his official influence to transfer the presidency to Vargas, who was very unpopular, and within four months was overthrown and banished. Paez came from retirement, gathered an army, took the capital, reinstated Vargas, and, ultimately succeeding him, was made dictator. In 1847 he transferred the presidency, against the protest of congress, to Monagas, who caused his soldiers to invade the assembly, killing some and dispersing the rest. Paez finally took up arms against the government, but was outlawed, defeated, and escaped to New York. In the election to succeed Monagas three candidates were in the field, and as none had the constitutional majority, the election went to congress, and Monagas' brother Gregorio was selected, and until 1858 the two brothers alternated in the presidency. In that year their career ended by a revolution, which created a provisional government that brought in Castro as president; but his was a turbulent reign, and he was displaced by Gual, who tried and convicted Castro as

a traitor and then pardoned him. Tovar succeeded by election to the presidency, and he recalled Paez and made him commander-in-chief of the army, but the latter quarreled with Tovar, compelled him to abdicate, and placed Gual again in the presidency. Gual likewise lost the favor of Paez, the president and his ministers were imprisoned, and Paez was declared dictator. Revolution and anarchy followed for two years, when Paez and his partisan, Rojas, had to surrender the government to the insurgents under Falcon in 1863. A constituent assembly and a new constitution followed in 1864, and Falcon, the insurgent leader, was declared president, and he turned the government over to his partisan, Trias, which occasioned a new revolution, and general anarchy and financial distress prevailed. In 1867 congress gave unlimited powers to the president, but the next year Monagas, after defeating Falcon, succeeded to the presidency, and died in office. His adherents made Pulgar provisional president, but the Falcon party, led by General Guzman Blanco, were enabled to overturn the provisional government, and Blanco entered upon his checkered career, covering several years, in which he assumed dictatorial powers, to be at last rejected by his country, and he spent the last years of his life in Paris, enjoying luxurious ease with his ill-gotten fortune. He was followed by a list of constitutional and revolutionary rulers, in turn, up to the actual president, Castro, who came to power through force and betrayal of his chief.

Let us turn from this dismal narrative to a less dreary story, but one which illustrates as well the point which I am seeking to make clear. Chile has had from the beginning of its existence a more fortunate career, in that its wealthy and more intelligent citizens have usually controlled the government, and as a result it has prospered and its financial credit has led all the other states. But

it will be seen that when private animosities or personal ambitions were awakened, constitutional provisions were of little avail. After Chilian independence was secured, General O'Higgins was called to the head of the government and became dictator, but he was finally driven from power by a revolution and Freire was chosen president in 1823. He remained in office three years, but was troubled with frequent insurrections, and the four years following his retirement saw six dictators. In 1828 a new constitution was promulgated, and in 1831 Prieto was chosen president, and from that date for many years a constitutional form of government was enjoyed, although defeated candidates for the presidency more than once organized unsuccessful revolutions on the ground that they had been defrauded in the elections. In 1890, near the close of Balmaceda's term, he was suspected of selecting the chief of his cabinet to be his successor. This choice was contrary to the wishes of the majority of the congress, which body refused to vote the budget appropriations, and Balmaceda retaliated by dissolving congress. The leaders of the latter went on board the government fleet, which pronounced in favor of the Congressional party, and thus a revolution was inaugurated which resulted in the overthrow of Balmaceda. One of its evil effects was to bring about complications with the United States nearly ending in war, and which have embittered the Chilians strongly against our Government.

The record of all the Latin-American republics has not been as bad as that of Venezuela, though some of them equal it in their history of anarchy and misrule, and few, if any, of them have even as clear a record as that of Chile; but they all teach the same lesson of inability to respect the constitutional provision as to the executive power, when a fierce electoral campaign is carried on. Such a test as came to the Congress of the United

States following the Jefferson-Adams campaign of 1800, the Jackson-Adams-Crawford-Clay campaign of 1824, or the Hayes-Tilden campaign of 1876, would almost inevitably bring about a revolution or a disregard of the constitution in any of the Latin-American States.

The experience of the past year demonstrates the lesson of their history. We have been reading the almost daily reports of the revolutionary movements in Venezuela and Colombia. The disorders in Venezuela had their origin in the election about three years ago, when Andrade was declared to be chosen president over his competitor, Hernandez. The latter contended that he was the real choice, and his partisan, General Castro, took up arms to place his candidate in the executive chair. Castro defeated the government forces and drove Andrade from the country, but in place of installing Hernandez in power Castro imprisoned him, and declared himself president. Hernandez succeeded in escaping, and both he and Andrade are now reported to be seeking to drive the usurper from power; but even if Castro is displaced the two claimants will still have their own contest to settle. A late telegram states that a constitutional convention has been convoked by Castro, and that this body will frame a new constitution, with an article extending the president's term of office from two to seven years.

President McKinley, in his last annual message, stated that "the executive power of Colombia changed hands in August last by the act of Vice-President Marroquin in assuming the reins of government during the absence of President San Clemente from the capital." This gave rise to armed resistance, and we have had for months the periodical announcement that the revolution had been put down, only to break out again with fresh vigor. The diplomatic representative of the revolutionists recently announced from New York that

"the liberals will never consent to serve again under a president forced upon the people by the conservatives." The New York *Independent*, in seeking to give its readers an account of affairs, says: "The revolution in Colombia that was said to be put down some months ago is alive again and widespread. It is a most remarkable fact that this revolution has caused the loss of thousands upon thousands of lives, and yet no one seems to know anything about it. Cities are taken and retaken, generals are killed, neighboring republics are accused of helping the insurgents, business is paralyzed, towns are razed to the ground, and yet there seems to be no principle involved, nor wrong to be redressed by either party's victory."

I have noticed the provision of the constitution of Brazil, one of the most recent, which, in addition to the prohibition of reëlection, makes ineligible to the presidency candidates related by blood or marriage to the outgoing president in the first or second degree. This is intended to strike at an evil akin to the continuance in power of the incumbent—the perpetuation of the same family influence in the executive office. We have seen that in Venezuela two brothers alternated for some years in the presidency, until overthrown by revolution. Two of these republics are today governed by the same family, one president making way at the end of his term for another member of the family.

Owing to the sad experience of the past, the Latin-American States have, as we have seen, with a great degree of unanimity attempted to remedy the evil by inserting in their constitutions a prohibition against the reëlection of the chief executive; but that has proved in many cases a most ineffectual remedy, because the men who are ready to resort to arms to secure what they claim as their rights seldom hesitate to disregard the constitution, or else find means to amend it to suit the exigency.

I have referred to the fact that one of the exceptions in existing constitutional prohibitions of reëlection is to be found in the fundamental code of Mexico. The circumstances which have brought this about are peculiar and interesting. The constitution of 1857, still in force, contained no such prohibition. General Porfirio Diaz was twice a candidate for president against Juarez, and he claimed that he was the people's choice, but had been counted out by the administration officials who had control of the elections. Lerdo, the head of the cabinet, became president upon the death of Juarez, and when the time approached for the election upon the expiration of Lerdo's term, Diaz announced to the country that it was useless to stand as a candidate, because of the absolute control of the electoral college by the government. He therefore issued a *pronunciamiento*, declaring for an amendment of the constitution, and with the cry of "no reëlection," he organized a revolution which was successful. Lerdo and his cabinet fled to the United States, Diaz assumed the presidency, ordered a new election, and was unanimously chosen. The constitution was in due course amended so as to prohibit the reëlection of the president until four years after his first term had expired.

At the end of his term Diaz retired from office, and his favorite general was elected his successor. The latter proved so inefficient and dishonest that at the end of his term all classes clamored for the return of Diaz, whose first administration had been quite a successful one. His second term was even more successful than the first. Peace and security prevailed throughout the land. Commerce, agriculture, mining—every industry of the country—prospered as never before. Railroads were built, capital began to flow in from abroad, the government credit, which had been utterly discredited for nearly half a century, was fully reëstablished. No one

would listen to his retirement, and so the prohibiting amendment was stricken out of the constitution, and Diaz was again chosen president; and he has again and again been reelected without any open protest, and for a quarter of a century he has been the untrammelled ruler of Mexico. Every one conversant with the history of that country concedes that he is the best ruler it has had since the independence. He has given it peace, order, and the reign of law. It has risen phoenix-like from the ashes of anarchy and commercial death, and the praises of Diaz as an administrator and a patriot are sounded at home and abroad.

But what becomes of the principles of republican government? Diaz, through his strength of character and wise government, has been the supreme ruler, although acting through the channels of constitutional authority and representative institutions. This example may raise the doubt whether republicanism in its extreme form is adapted to these countries, or whether some limitations should not be placed upon it. The present is probably Diaz' last term, as he is now past seventy, and I believe he is sincere in his expressed desire to retire to private life. The test of republican government will come when his successors are to be chosen. Not the first, but probably the second term will test the ability of the Mexicans to choose their rulers in peace and observe republican practices. Mexico, like its southern neighbors, has not yet fully proven its capacity to consistently follow these practices and to peacefully and by constitutional methods transmit the executive power from one ruler to another.

How far the people of these countries are fitted to carry on republican and representative government in our sense opens up a topic which cannot be pursued in this paper; but I offer a few suggestions by way of explanation of the apparent failure in many of them.

First, the great mass of their populations are ignorant and uneducated; in many of the countries they do not even read and write the official language of their government, and as a rule take no part in the elections. They, however, compose in the main the armies of the government and the revolutions. Second, the people of these countries, both the educated and the uneducated, had no experience in self-government before their independence. In this respect the British-American colonies had a great advantage over them, and we should be charitable in our criticism of them. The misfortune is, however, that they have had very little practice in genuine republican government since their independence. They understand the force of the bullet much more than the ballot. The result has been the rule of the dictator or usurper more often than that of the real representative of the people. The intelligent men, the best citizens, and the property-holders deplore the revolutions, and they are exerting themselves to put an end to these practices, and their good work is apparent in some of the countries, and I think the general tendency is toward orderly and constitutional government.

This subject has a special interest for the people of the United States:

First. It raises the question how far it is the duty of our Government to interpose respecting an American republic, which has fallen into anarchy, against the encroachments of European powers whose subjects have suffered outrages at the hands of the local military powers? I fully sympathize with the Cleveland administration in its action on the Venezuelan boundary question, but many Americans thought it would have been better for the interests directly concerned if all the territory in dispute had fallen under British sovereignty.

Second. We are often embarrassed as a nation by these frequent revolutions. I have noted how near we came to war

with Chile because of its disturbed condition and the enmity engendered by the action of our Government. We have commerce with all these countries, many of our citizens have invested capital therein, and these interests cannot fail to be injured by the civil disorder occasioned by the strife of ambitious men. Does any one believe that our Government could look on with indifference if our next door neighbor, Mexico, should again fall into anarchy, as at frequent intervals in the past, and the millions of American capital which has been attracted thither by the beneficent rule of Diaz should become the prey of revolutionists and rival aspirants for the presidency?

Third. The Spanish war has made the subject a practical problem for us. The territory which we took from Mexico was soon overrun by Americans, and its government was readily adapted to our system. But Porto Rico is already densely populated with people educated in Spanish-American methods of government. We have already had an exhibition of the embarrassments to be overcome. In the first election held under the territorial organization provided by Congress a practice was resorted to very common in the Latin-American republics—when one party finds itself outnumbered or outwitted in the campaign, it abstains in a body from the election, and then cries fraud or force. We read that in the late election in Porto Rico for the territorial legislature and other offices, one party, the Federals, refused to go to the polls, and the Republicans, as a consequence, elected all their candidates; but in celebrating the victory they were attacked by the Federals, and several were killed and wounded in the affray.

We have by act of Congress become responsible for the establishment and maintenance of a stable government in Cuba. The history of their brethren of the same race in Central and South America does not give much assurance that the Cubans will soon attain the position required by Congress. One of the first steps in that direction which is foreshadowed, the election to the presidency of a professional revolutionist, born and educated in San Domingo, does not argue well for the future. In the election held to choose delegates to the convention to frame a constitution, only a minority of the qualified electors took part, and I have good authority for the statement that fully 95 per cent of the electors representing the property interests of the island abstained from the election.

And yet it appears that this minority of the people of Cuba are to frame its organic code, to set the machinery of the new government in motion, and to determine the relations which are to exist between the new government and the United States.

This review, it must be confessed, does not present a cheerful outlook for the friends and admirers of republican government, but for the citizens of the United States at least it suggests a solace. It is a consolation to us to know that the men who laid the foundations of our Government and have thus far conducted its affairs have appreciated the value of peace and the superior merits of the ballot over the bayonet; that we had a Washington, not a Bolívar nor an Iturbide, to put the Government in motion, and that the Constitution has been held as too sacred an instrument to be made the sport of ambitious rivals for the presidency.

MEXICO OF TODAY*

BY SENOR DR. DON JUAN N. NAVARRO, CONSUL-GENERAL OF
MEXICO IN NEW YORK CITY

A GLANCE at our factories shows that our people manufacture acids, chemicals, candles, excellent beer and ale, carpets, furniture, and carriages that have received premiums at some of the Paris expositions, cordage, glassware, hats, matches, paper of every description, sugar, tobacco, and many other articles, the production of which increases every day in quantity and quality. In the last few years the textile industry of Mexico has progressed at a surprising rate, and some of the manufactories deserve special mention. Rio Blanco is a manufactory situated near Orizaba. I personally visited this manufactory a few months ago and found that it produces eighty different classes of linen and cotton goods, has a colossal and tasteful building, and maintains in incessant work more than 3,000 workmen, who make 40,000 pieces per week. I have in my office, in New York, a complete set of samples of all the linen and cotton goods from this manufactory, and all, especially the prints, in the perfection of the work and in the beauty and taste of colors and designs, excite the admiration of all who examine them.

I have not at hand the statistics giving the actual number of cotton manufactories, but I calculate that there must be approximately 150, and that they last year produced more than ten millions of pieces of white and printed goods and nearly two millions of yarn. The sales declared for taxes for the years 1898 and 1899 are more than \$29,700,000. Another of the manufactories near the city of Orizaba makes bags for flour, grain, salt, etc. The raw material is jute,

a fiber originally imported from East India, which has been planted in Mexico and in all probability will yield a good harvest. This establishment makes 7,000 bags per day and 800 meters of carpets and rugs of the same material. The motive power in these factories is electricity derived from the falls of the Rio Blanco.

The wool manufactories, though not so many, are remarkable for the excellence of their products, and are not often excelled by the best products of other countries. The number of tobacco manufactories is very considerable, and the fame of the excellence of the material and elaboration is spreading day by day in the commerce of the world. Another manufactory worthy of mention is the one in Merida for cordage. The capital invested in mounting it was \$600,000, and up to September of last year there were exported to this country by way of the port of Progreso more than two millions of kilos of the *henequen* cordage there manufactured.

Our government has promised certain privileges for the introduction of new industries into the country, and the department for correspondence has received 114 applications.

I have always believed that Mexico is destined to be not only an agricultural but an industrial country, as it produces a great number of vegetable raw materials and possesses an incomparable quantity of every known metal, and has living in cities a good part of its population who have a decided inclination and a remarkable ability for mechanical labor. The facts of her development are confirming these views.

* Continued from the April number.

The scientific boards and establishments of the government render good services to science in general and particularly to our country. There is a geodesical board that, besides other scientific occupations, is measuring the part of the arc of the meridian corresponding to Mexico.

La Comisión Geografica Exploradora (the geographical exploring board), in order to make a correct map of the republic on a large scale, is now working in the States of Nuevo Leon, Vera Cruz, and Tamaulipas. The topographical surveys measure an area of 424,148 square kilometers, the itineraries 142,799 lineal kilometers, and the number of positions astronomically determined is 424. The learned members of this Society can appreciate properly the time and scientific labor represented by these operations.

Our astronomical observatory in Tacubaya, Federal District, is in constant communication with similar institutions in the civilized world, and our directors have visited them repeatedly and been present at the astronomical congresses of all nations. It has also the honor of taking part in the formation of a photographic zone of the celestial map that is to be executed by international convention.

Speaking of this science, it is worth mentioning that Mexico, since colonial times, has always had remarkable astronomers, and in the seventeenth century the illustrious Don Carlos de Sigüenza y Gongora, of European renown, was appointed by Charles II of Spain his royal cosmographer. In our times we had Diaz Covarrubias, and in fact Mexico, since the sixteenth century, has taken a prominent part in all astronomical observations, and was one of the many countries to observe the transit of Venus through the disc of the sun more than 100 years ago.

There are also meteorological observatories in connection with those of the

United States, and a geological institute, one of whose works, the geological cut from Acapulco to Vera Cruz, figured very advantageously in the last Paris Exposition, and many other scientific institutions supported by public funds or by private enterprise.

To give some idea of our means of communication and public works, I shall mention some facts about our railroads, telegraphs, telephones, and postal service, and of some of the great works in the capital and states.

Besides many hundreds of miles of railways in active construction, we have in actual operation 14,573 kilometers, or 9,055.22 English miles. In the last four years 3,104 kilometers of roads were finished.

Mexico being a mountainous country, the cost of these roads in many cases was enormous; but we can boast of having some of the most daring and magnificent works of engineering and of the most picturesque views in the world. One of the two railroads connecting the capital with the port of Vera Cruz has a section literally above the clouds, and, according to the opinion of foreigners visiting the country, the trip of any tourist would be amply repaid by only traveling on that magnificent railroad, so solidly and skillfully built and cautiously run that an accident of a serious nature has never happened in more than 28 years of continual operation. For construction and splendid scenery, the railroads running from Morelia to Uruapan, in the state of Michoacan, and from Puebla to Oaxaca, connecting the two states of said names, can be especially recommended.

The number of passengers increases at an enormous rate year by year. In 1893, 22,781,343 passengers were carried on Mexican railways; in 1900 this number had nearly doubled, exceeding 40,000,000. Of merchandise, 3,798,360 tons were carried in 1893, and in 1900 nearly 8,000,000 tons.

The development of our telegraphs has kept pace with the railroads, and today there is not a place of any importance that is not connected telegraphically with the rest of the republic.

Our telegraphic lines are divided into four different branches—federal lines, state lines, private company lines, and railroad lines—and the federal lines last November had an extension of 45,740 kilometers, or 28,421 English miles. President Diaz in his last report mentions only the federal lines, but, according to the statistical annuary, of the state lines there were, on December 1, 1898, 8,659.4 kilometers; of lines belonging to private companies, 3,690.240 kilometers, and of railroad lines, 11,198.195 kilometers. Adding these lines to the 45,740 kilometers of federal wire and we have a total of 69,287.881 kilometers, or about 43,053 miles.

The extension of telephone lines in December, 1898, was 28,433 kilometers, but in the last two years many more lines have been constructed, and we can estimate that there are now 30,000 kilometers, equivalent to about 18,641 English miles. The number of messages transmitted by federal telegraph only during the year 1892-'93 were 1,083,359, and during the last year, 1899-1900, this number had more than doubled.

The federal offices in the capital and other principal ones are open day and night, and the night service has been so well patronized by the public that it covered its expenses almost immediately after being established.

Our telegraph lines are connected at different points with those of the United States and by two submarine cables—one from Galveston to Tampico and the other from Tampico to Vera Cruz. Through the United States we are in communication with any part of Europe, while the United States, through our telegraph lines from the Atlantic to the Pacific Ocean and a cable from Salina Cruz to Libertad, communicates with

the greater part of South America as far as Brazil and Chile, and by land with Guatemala and the other Central American republics. We have one telegraph cable at Alvarado Bar, and three others between Tuxtepec and Cosamaloapam, another between Champoton and Campeche, and one between San Juan Bautista and Nopalapam.

Our government has established a school of telegraphy where girls receive gratuitous instruction.

Our postal system is continually studied and improved, and the results obtained are of the most gratifying order. The number of offices in 1900 was 1,972, including 96 on railroad cars.

The public works completed and those in the course of construction are too numerous to mention. Two, however, the drainage canal of the valley and city of Mexico and the great docks and wharves in the port of Vera Cruz, deserve special consideration, because of their colossal magnitude and importance.

The city of Mexico is situated in an extensive and beautiful level valley, surrounded by lofty mountains. There is no natural exit for the water that pours from the mountains or for the refuse of a large city. In consequence the inhabitants were exposed to the perils of floods which at different times in the past became a reality. The Spanish Government early took the matter in hand and approved the project of the celebrated engineer, Enrico Martinez. He constructed the gigantic cut now in existence and known by the name of "Tajo de Nochistongo." But, although that work had averted the danger from the side of Cuautitlán, deviating the course of the river of that name, it did not solve the whole problem. The solution as completed was first proposed by another Spanish engineer, Simon Mendez, whose plans, with some modifications, constitute the work now finished.

The work was undertaken and suspended several different times for the want of funds and the uncertainties produced by revolutions.

In the year 1885 it was resumed in earnest, and incessantly and vigorously prosecuted until its completion, by General Diaz, who, with his usual activity and energy, put it under the direction of a board of distinguished citizens. The Mexican engineer, Dr. Luis Espinosa, was the technical director, who modified advantageously the original plan and brought it to a happy termination with an ability, energy, and constancy that deserve the gratitude and admiration of all his fellow-citizens.

The completed works consist of a canal, with a length of 30 miles, and a tunnel of more than six miles. The canal runs from the northeastern section of the city, called San Lazaro, to the town of Zumpango. There the enormous mass of water enters the tunnel cut through the mountain, and on the other side disgorge into the ravine or Barranca de Tequisquiac, in which it is confined till it reaches the Gulf of Mexico. The works are laid out in such a way that when the system of canalization of the streets of the city is finished, according to the plans presented by another distinguished engineer, Dr. Roberto Gayol, the water of the lakes, principally of Texcoco, which is the lowest, will be controlled, and Mexico will be perhaps the only city in the world which will be able to wash its sewers every day. This last work is being vigorously pushed, and it is expected will be completed during the last months of the present year. Mexico has good reason to be proud of this magnificent work, which has cost her many millions of dollars.

A few words will give some idea of the magnitude and usefulness of the public works in the port of Vera Cruz. The city of Vera Cruz was founded by the Spaniards for military and not for commercial purposes. It was planted within the fire of the guns of the fortress, San Juan de Ulua, which they had built on a rock in the bay. The port was a bay, or rather an open roadstead, where ships could find no protection in a storm. Often the shipmasters preferred to lift anchor and battle with a tempest on the high seas. Today the old fortress is a part of the city, and can be reached by carriage, and the open roadstead has been converted into a safe port, with wharves for the largest vessels and every convenience for the landing of passengers and the loading and unloading of ships.

In many other ports on the Gulf and the Pacific Ocean improvements are being constantly made. In Tampico a new wharf is nearly completed to replace the one destroyed by fire in 1888. In San Juan Bautista four wharves have been finished. The fiscal wharf in Frontera is completed and in use, and also the one in Progreso. Very important works are in progress in the ports of Salina Cruz, the Pacific end of the Tehuantepec Inter-Oceanic Railroad, and Altata, a port that is to be changed to Tetuan, which offers a better anchorage for vessels.

In the last four years many lighthouses have been built on the coast of Yucatán, in Isla de Mujeres, Cayo Norte, Cabo Catoche, Contoy, Punta Molar, and Punta Calarain and on the Pacific coast, on Morros de Seybaplaya, Salina Cruz, Santiaguillo, Isla de Arcas, Zapotitlan, Cayo Lobos, and Puerto Angel.

(To be concluded in the June number.)

THE GENERAL GEOGRAPHY OF ALASKA

BY HENRY GANNETT, CHIEF GEOGRAPHER, UNITED STATES
GEOLOGICAL SURVEY

ALASKA, our northernmost possession, extends over more than 20 degrees of latitude and 45 degrees of longitude—as far as from Florida to Maine and from Maine to Utah.* From the main body of the Territory stretch two projections, one to the southeast, comprising the Alexander Archipelago and the adjacent mainland, the other to the southwest, comprising the Alaska Peninsula and the Aleutian Islands.

The exact area of Alaska cannot at present be known, owing to the fact that the boundaries are as yet located only approximately. The seacoast, which forms by far the greater part of the boundary, has not been accurately mapped, except in small part, while the land boundary on the southeast, which separates our territory from Canada, has not been defined, except in the general terms of the treaty of cession from Russia. Various measurements have been made, based upon different maps, giving areas ranging from 570,000 to 600,000 square miles. A careful recent measurement from the large map published by the U. S. Coast and Geodetic Survey (scale 1:1,200,000) gives its area as 590,884 square miles. Of this the portion lying east of the 141st meridian, popularly known as southeastern Alaska, which is the best known part of the Territory, has an area of 43,710 square miles, of which 30,800 square miles consist of mainland and 12,910 square miles

of islands, forming what is known as the Alexander Archipelago.

The Cordillera of North America enters Alaska at its southeastern extremity and follows the Pacific coast around to the Aleutian Islands. Beyond this mountain system and following its general trend is a broad depression, drained by the Yukon River and its tributaries. North of this basin is a height of land which separates the Yukon Valley from the bleak shores of the Arctic Ocean.

THE PACIFIC COAST REGION

This portion of the Territory is mountainous throughout. Although the coast of the mainland and of the islands is, altogether, several thousand miles in length, yet for the entire distance there are very few square miles of level ground. The land rises from the water almost everywhere at steep angles, without a sign of beach, to altitudes of thousands of feet. It is a fiord coast. The islands are separated from one another and from the mainland by fiords, deep gorges, whose bottoms are in some cases thousands of feet below the surface of the water. These fiords extend far up into the mainland and into the islands, in deep, narrow U-shaped inlets.

The relief features of this region, its mountains and its gorges, partly filled by the sea, are all of glacial origin, presenting everywhere the familiar handwriting of ice. Every cañon, every water passage, whether called strait, canal, or bay, is a U-shaped gorge, and its branches are similar gorges commonly at higher levels—"hanging valleys" they have been called. Above

* It lies between latitudes 51° and 71° 30', extending 5 degrees within the Arctic Circle, and stretches from longitude 130° to 175°. The great body of the Territory lies, however, between latitudes 60° and 71° 30', and between longitude 141° and 168°.

the cliffs of the gorges the mountains rise by gentle slopes to the base of the peaks. The cross profile of each gorge and its surroundings is that of ice, not of water carving. It is the work of channel erosion, not of valley erosion, and the channels were filled with ice. It is a colossal exhibition of the eroding power of water in solid form. From Lynn Canal, a fiord 90 miles in length, there have been carried off and dumped into the Pacific more than 200 cubic miles of rock, and from all the fiords of southeastern Alaska the amount removed may be safely estimated at thousands of cubic miles. The ice has but recently retreated from these gorges, for since its retreat water has done but little work, although the region is one of heavy rainfall and extremely steep slopes, where aqueous erosion is at a maximum.

Of the great glaciers which occupied this region a short time ago, only trifling fragments remain in the upper ends of the gorges, and comparatively few now reach the sea. I use the word trifling, however, merely in relation to their former extent, for absolutely these remnants are not at all trifling. The ice cap of Greenland and the glaciers of the Antarctic continent alone exceed them in magnitude. All the glaciers of Switzerland together would form but a few rivulets of ice on the surface of the great Muir Glacier, and the Muir is but one of many glaciers of equal magnitude. Indeed, on this coast are scores of live glaciers, glaciers which reach the sea, presenting to it fronts of ice or ice walls rising from the sea bottom to 200 or 300 feet above its surface, and several miles in length, and which drop bergs, with thundering sound, into the sea. Of such glaciers no fewer than 30 were visited by the Harriman Expedition, and many others are known. Of dead glaciers, or those whose fronts do not reach the sea, hundreds are known.

The mountains increase in height to-

ward the northwest, but not at a uniform rate. They culminate near the coast in the Fairweather Range, south of Yakutat Bay, at about 16,000 feet, and in the St. Elias Range, west of Yakutat Bay, at 18,000 feet or more. These ranges are not regular or continuous. While they follow the general direction of the coast, toward the northwest, they are extremely broken, being cut through on the mainland by many fiords and by streams flowing into the heads of the fiords. The Stikine, which reaches the coast near Wrangell, heads far to the eastward, in Canada, and cuts across the entire breadth of the Cordillera system. The same is true of the Taku River, which, flowing through Taku Inlet, reaches the coast near Juneau; and of the Chilkat, which flows into one of the heads of Lynn Canal. Alsek River heads far to the north, in Canada, and cuts a gorge through the great Fairweather Range. These are the main rivers of this coast, but there are many smaller ones, which head either beyond the mountains to the north and east, or far within them.

The coast line from Cross Sound northwestward to Prince William Sound is comparatively smooth and simple, containing no inlet of magnitude, with the exception of Yakutat Bay. As far as Yakutat Bay it is closely bordered by the Fairweather Range, which rises abruptly from 10,000 to 16,000 feet almost from the water's edge, bearing on the summit a succession of peaks and covered with glaciers along both slopes. A day long to be remembered was that on which our ship steamed, between 8 o'clock in the morning and 6 in the afternoon, from Yakutat Bay to Cross Sound, along the entire front of this range outlined against a cloudless sky.

Yakutat Bay is a deep funnel-shaped bay, penetrating far into the heart of the mountain region. At its apparent head it turns sharply upon itself to the south and extends back nearly to the

sea in a narrow fiord, bordered on either side by high mountain walls. This extension, heretofore named Disenchantment Bay, has been rechristened. The story of the locality is as follows: More than a century ago Malaspina, the Spanish navigator, entered Yakutat Bay while in search of the Northwest Passage. Sailing on up the bay and finding that open water extended far inland, he for a time thought that for him had been reserved the fame and satisfaction of discovering the long-sought route through the North American continent. His dream was short, however, for on nearing the bend in the bay he found his way blocked by a solid wall of ice. This ice was the front of the combined Hubbard and Turner glaciers, which then extended far beyond their present limits, completely closing the entrance to the fiord above, which at that time was probably an open lake some 200 feet above the level of the sea and overflowing southward into the Pacific. In memory of his disappointment, Malaspina named the upper part of Yakutat Bay "Disenchantment Bay."

Prof. I. C. Russell, when exploring the head of the bay in 1891, discovered the fiord, and in an open boat traversed it for its entire length. Instead of naming it, he extended the application of the name Disenchantment Bay to cover it. We have rechristened it, in honor of its discoverer and first explorer, Russell Fiord. Our ship, the *George W. Elder*, was the first large vessel to go to the head of this fiord. We made the passage under the pilotage of a Yakutat Indian, and lay at anchor over night at its head.

Northwest of Yakutat Bay for many miles the shore is covered by a field of ice, Malaspina Glacier, which is in the main a stagnant pool, wasting only under the heat of the summer sun, and supplied by ice streams from the St. Elias Alps, which border it on the north and east. Farther to the northwest stretches a low coast, rising into mountains a score

or two of miles inland. Through these mountains flows Copper River, at whose mouth is an enormous delta, built up of detritus which it brings down from the interior.

Then comes Prince William Sound, a bay of irregular shape, with many tentacle-like fiords extending in various directions into the land. Its entrance is nearly closed by islands between which are several navigable passages. The islands near the shores are everywhere mountainous, and on the north shore mountains rise to about 10,000 feet, the higher ones everywhere skirted with glaciers, many of which come down into the sea. Several of the fiords are of great length, reaching far inland. Thus Port Valdez, up which the Copper River route to the interior passes, extends inland more than 30 miles, and Port Wells, on the northwest of Prince William Sound, pushes 40 miles into the interior, far up among the high mountains, and each of its branches terminates in a living glacier. Passage Canal, too, up which runs the portage route to Turnagain Arm of Cook Inlet, has a length of 30 miles.

Prince William Sound, in the mountainous character of its shores, in its multitude of islands and fiords, and in the almost total absence of level land, resembles southeastern Alaska. It was until recently but little known, all our information concerning it being derived from the explorations of Vancouver and Malaspina, made a century or more ago. Within the past two years, however (1898 and 1899), exploring parties under Captain Abercrombie and Captain Glenn have supplemented the work of Vancouver and Malaspina, and have added materially to our knowledge of the coast and adjacent lands. Some additional information also was gained by the Harriman Expedition, especially concerning Columbia Fiord and Glacier, and of Port Wells and its glaciers, in the form of sketch maps and photo-

graphs of these localities. The head of Port Wells and a large branch coming in from the west were explored and mapped. This western branch, shown on the sketch map as Harriman Fiord, was in all probability closed at no very remote time by the front of Barry Glacier, which extended across the fiord to the opposite shore; indeed, until our visit, it was still supposed to be closed. In bringing our ship close to the glacier front to obtain photographs of it, our party discovered the opening between its point and the land, and as we steamed through we saw unfolded before us a magnificent vista of mountain and glacier.

"We were the first that ever burst
Into that silent sea."

It was sunset when we entered the portals, and through the long twilight of the Arctic evening we passed up the fiord, with mile-high mountains and great glaciers on either hand. A little before midnight we reached its head, where it is terminated by the front of Harriman Glacier. A surveying party was landed there, and two days were spent in making a reconnoissance of the fiord and its surroundings. In this fiord, in a length of 15 miles, there are, besides a score of "dead" glaciers, five live glaciers, four of them of the first magnitude, and all reaching the sea and discharging bergs into it.

The general direction of the coast, which trends northwest to a point beyond Mount St. Elias, gradually swings to the westward, and beyond Prince William Sound turns toward the southwest in the Kenai Peninsula. Beyond the end of this are mountainous islands—Afognak (594 square miles) and Kodiak (3,642 square miles), the latter the largest island in Alaska waters. These continue the line of Kenai Peninsula to the southwest, and are separated by the waters of Cook Inlet and Shelikof Strait from the Alaska Peninsula. This

latter peninsula bears the backbone of the mountain system which follows the coast, the westward extension of the Cordillera. Of its structure little is known, except that here and there are upturned stratified beds and occasional volcanoes, some extinct, others still smoking, as if the internal fires were banked but not extinguished. Among these are Redoubt, Iliamna, St. Augustine (on an island near the coast), Pavlof, and many others. Beyond the west end of the Alaska Peninsula its general direction is continued by groups of islands and islets, as if the mountain range of which it is composed were sunken below the sea and only the summits of its peaks protruded above the waves. These are the Aleutian Islands. Upon them also are many volcanoes, some alive, some dormant.

BERING SEA

Just north of the Aleutian Islands, which run in a broad curve, convex southward, over ten degrees of longitude, are two islands, Bogoslof and Gremick. These are very young, the older having come into being 104 years ago, the other being but 17 years of age. Only half a generation ago it rose from the sea with great fury and turmoil of escaping steam, and although for 17 years its shores have been bathed in the icy waters of Bering Sea and its summit wrapped almost constantly in chilling fogs, it is still hot and gives out steam. Its older brother has long since cooled and is now the nesting place of millions of birds and the breeding ground of hundreds of sea-lions.

North of these rocks, far in the gloom of the eternal fogs of Bering Sea, lie the Seal Islands, or Pribilofs, St. George and St. Paul—little islands of hills and gentle slopes of tundra, clothed in summer with a rich mantle of grass and flowers. Still farther north, in the midst of this dreary sea, where the sun seldom

shines, are St. Matthew and Hall Islands, buttressed by cliffs, above which are undulating slopes of tundra, grassy and gay with flowers, and beyond them St. Lawrence, a mountain island fringed by a boggy plain.

The Alaska coast of Bering Sea is mainly low and marshy, rising very gently inland, and consisting almost entirely of tundra. The Yukon, the great river of Alaska and one of the great rivers of the earth, ends its long journey seaward in an enormous delta, which covers thousands of square miles. Through this great area of low level land its distributaries meander sluggishly to the sea, bringing from the interior mud and gold and driftwood, to be spread along the coast by the currents.

Such is the Alaska coast: where it faces the Pacific, bold, rugged, and bordered throughout by a mountain barrier; where it faces Bering Sea, low, tundra-clothed, and affording easy access to the interior by means of its great river.

THE INTERIOR

Of the interior of Alaska we know much less than of its borders. Not only did the early explorers confine their attention almost entirely to its coasts, but the inhabitants, both natives and Europeans, owing to the difficulties of land travel in the interior, have always lived upon the coast or upon the larger streams, and have made their journeys by the water routes. It is only in recent years that definite geographic information concerning the interior has been obtained, and at present, through the extensive explorations carried on by the U. S. Geological Survey and officers of the U. S. Army, such information is rapidly increasing.

The primary slope of the land is toward the west and southwest, as is indicated by the courses of the great rivers of the Territory—the Yukon,

Kuskokwim, Koyukuk, and others. The trend of the mountain uplifts, on the Pacific side, swings around from northwest to southwest, thus following the general course of the coast. Of the great features of the Territory this chain forms the southernmost, and is the key to the structure of the country. Succeeding it on the north is the great valley of the Yukon, which is separated from the Arctic coast by ranges of low mountains and broken country, probably nowhere exceeding 5,000 or 6,000 feet in altitude.

The Cordillera attains its greatest breadth and altitude between longitudes 142° and 152° . Here are many summits reputed to exceed 12,000 feet in height, with Mount Wrangell, said to be 17,500 feet, and Mount McKinley,* so far as known, the highest summit on the North American continent, rising to an altitude of 20,464 feet. In this portion of the mountain system are the sources of many large rivers, the White, a branch of the Yukon; the Copper, well named on account of the enormous deposits of copper ore found near it; the Sushitna, flowing into the head of Cook Inlet; the Tanana, another branch of the Yukon, and finally the Kuskokwim, which, heading in the western part of this group, flows southwest into Bering Sea. In the region north of the Yukon Valley originate many streams, including several large branches of the Yukon, as the Porcupine and Koyukuk; other streams, as the Noatak and Kowak, flow into Kotzebue Sound, and still others, as the Colville, flow northward into the Arctic Ocean.

The country is intersected by a network of rivers and lakes navigable for canoes, although navigation is much interrupted by rapids and falls. The great highway of the Territory is the Yukon River, which, heading in British Columbia, flows northwestward through a succession of lakes and rapids, and

* Longitude 149° , latitude 63° .

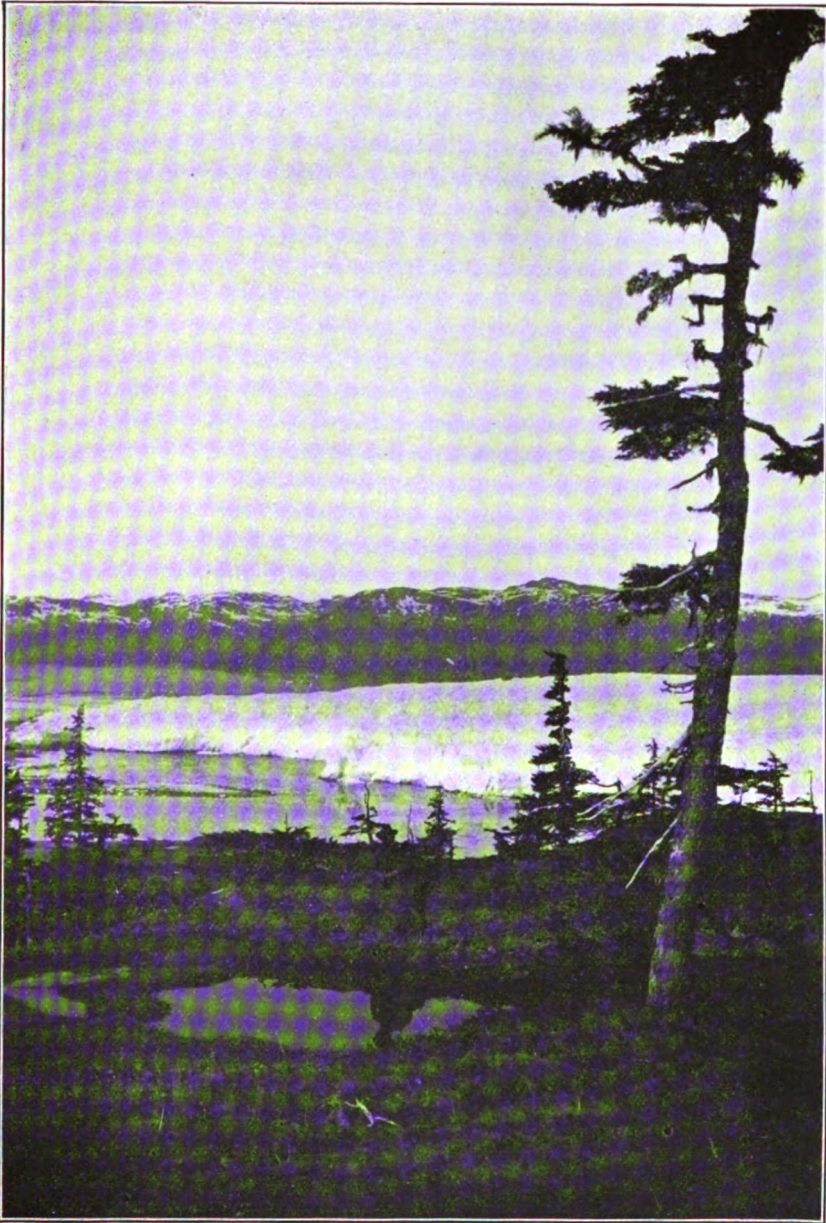


Photo by C. Hart Merriam

End of Columbia Glacier, College Fjord

crosses the boundary line in latitude 65° . It reaches its most northern point just on the Arctic Circle, in longitude 146° , and thence flows southwestward to its mouth. It is navigable for small steamers throughout its course in Alaska, and when not closed by ice—that is, from June to October—carries much traffic, since nearly all of the food, supplies, machinery, and other goods for the support of the mines in Alaska and the Klondike come by this route.

North of the Yukon most of the land is permanently frozen at a depth, thawing only near the surface in summer. Whenever the slopes are at all gentle such ground is marshy, forming the well-known tundra of the Arctic regions.

CLIMATE

• We must speak of the climates rather than the climate of Alaska, for different

parts of the Territory differ in climate, not in degree only, but in kind. The Pacific coast has a climate of its own, the coast of Bering Sea has another, and both differ widely from that of the interior.

The climate of the Pacific coast, from Portland Canal in the extreme southeast to Attu Island at the west end of the Aleutian chain, may be characterized, in a word, as "chilly." Take the well-known climate of San Francisco, with its dampness, fogs, and cold sea winds, reduce the temperature 15 to 18 degrees and increase the dampness and fog in proportion, and you have a fair idea of the climate of the Alaska Pacific coast. At Sitka, in latitude 57° , the mean annual temperature is 43° Fahrenheit, which is about the same as at Eastport, Maine, 12 degrees farther south. The extreme range of temperature on record

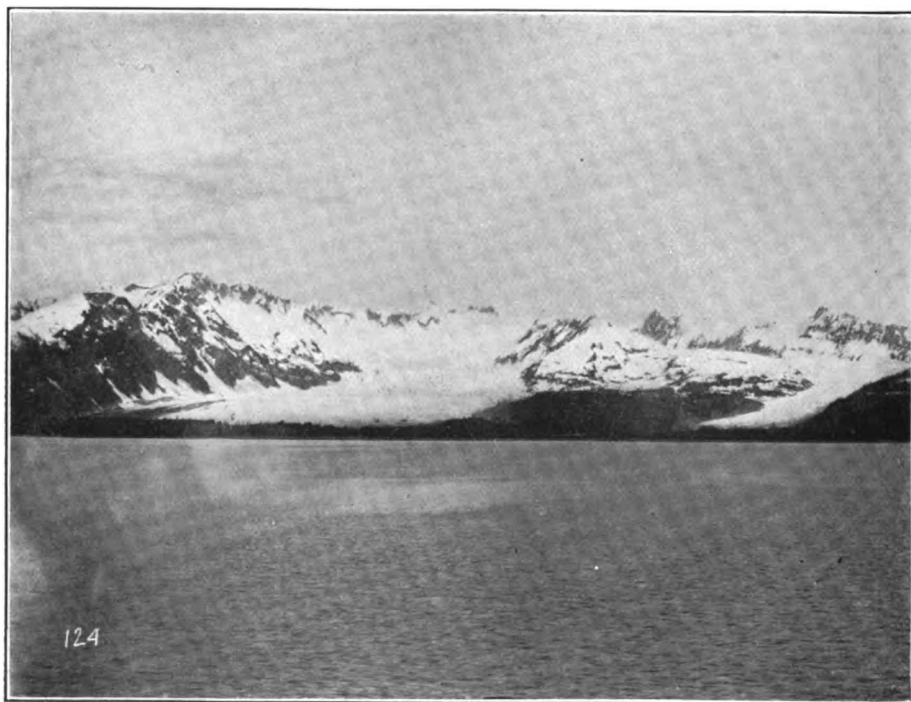


Photo by C. Hart Merriam

Amherst Glacier, College Fjord



Photo by C. Hart Merriam

Juneau

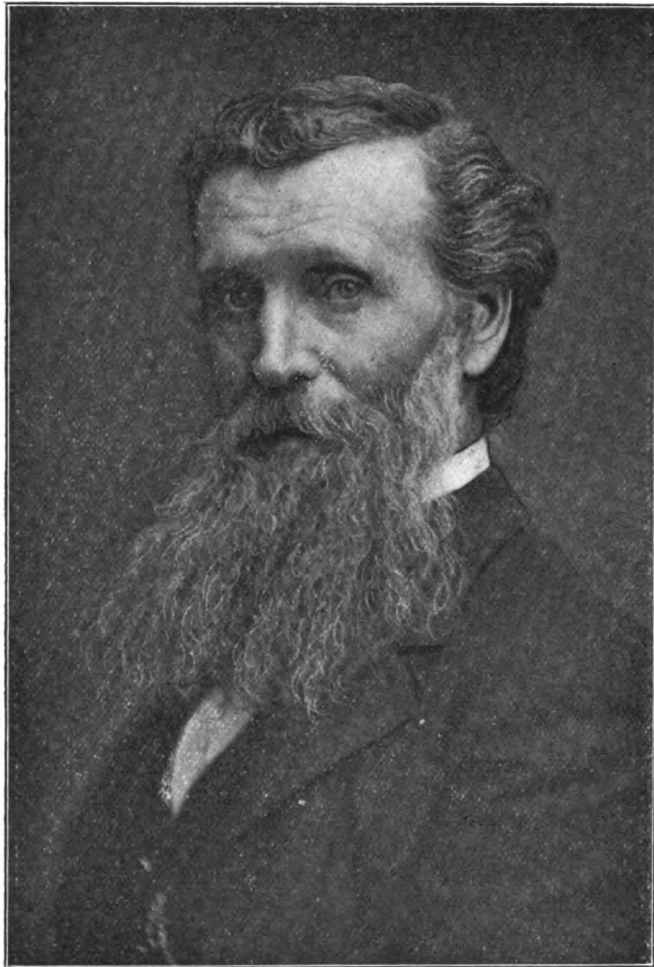
at Sitka is from a trifle below zero Fahrenheit to 90° above, and the monthly mean temperatures range from 31° to 56° only, illustrating the wonderfully uniform temperature of the Pacific coast. At Kodiak, 16 degrees farther west and a degree farther north, the mean temperature is 2° lower and the extreme range of temperature less. At Unalaska, 3 degrees south of Sitka, the mean temperature is only 36° and the range of temperature is still smaller.

While the mean annual temperature on this coast, whose latitude ranges from 54° to 60° , does not differ materially from that of Eastport, Maine, on the Atlantic coast, in latitude 45° , the summer temperature is much colder and the winter temperature much warmer. The statement has been made that it is

no colder at Sitka than in Georgia. I believe this to be true in the sense that the minimum temperature is no lower; but it represents only a part of the facts, and much the less important part. It is also true that it is no warmer at Sitka than in Greenland or Labrador—that is, the maximum temperature is no greater; and for most economic purposes, except the making of ice, it is warmth, not cold, that concerns us.

The annual rainfall is heavy over this entire coast. At Sitka it is more than double that of the Atlantic coast, 105 inches a year being the record, and it diminishes but little westward. At Unalaska the record is 92 inches. Rain falls mainly in the autumn and winter, the summer being comparatively dry.

A description of climate would be in-



John Muir

complete if it did not include the amount of sunshine and cloudiness, since these are important factors in the growth of plant life. At Sitka it is cloudy two-thirds of the time, and nearly half of the time it is raining or snowing. At Kadiak the conditions are a little better; at Unalaska they are worse, for Unalaska is unrivaled for bad weather. Only 8 days in the year during several years of record were entirely clear and only 45 partly clear, the remaining 312 being cloudy, and 271 of those were rainy or snowy.

Before attempting to explain these peculiarities of climate, it should be stated that the sea commonly produces two modifications of temperature. It may reduce the extremes, making the atmosphere cooler in summer and warmer in winter, and it may reduce or increase the mean annual temperature. The Pacific coast of Alaska is within the range of the prevailing westerly winds of the northern hemisphere. These winds come off the ocean, bringing to the coast the temperature of the sea. As the sea absorbs heat slowly, in comparison with the land, and parts with it as slowly, the winds blowing off it are cool in summer and warm in winter. Moreover, since the ocean has waves, tides, and currents, by which its waters are moved about, the cold water of the north toward the south and the heated water of the tropics toward the north, there is a tendency to establish an equilibrium of temperature. Thus the northern seas are warmer, on the whole—that is, the mean annual temperature is higher—than land in the same latitudes, and through the agency of the westerly winds the coast shares in this amelioration of temperature.

- These same westerly winds are responsible for another feature of the climate, the heavy rainfall. They come from the sea saturated with moisture, and if they find the land colder than they are, as it is in fall and winter, they are chilled below the point of saturation and disgorge copiously; but if they find



Photo by Curtis

An Indian Totem



Photo by C. Hart Merriam

Eskimo at Plover Bay, Siberia

the land warm, as it is in summer, they carry their moisture inland and the coast enjoys a comparatively dry season. This season is, however, dry only in comparison with the winter, the wet season. The rainfall of the three winter months at Sitka is commonly about 30 inches, while that of the three summer months is 16 inches, or more than half that of winter.

The fogs of this coast, really the most obtrusive feature of the climate, occur whenever the wind blows from the sea, which it does most of the time, even in summer. For obvious reasons they seldom or never occur with a land breeze.

The coast of Bering Sea has a climate widely different from that of the Pacific coast. The mean annual temperature is much lower, even after due allowance for the difference in latitude. At St. Michael it is 26° , and at Port Clarence, in Bering Strait, it is 20° . The range of temperature is much greater. The mean temperature of the coldest month at St. Michael is -2° , of the warmest month 54° , showing a range of 56° .

Similarly, at Port Clarence the coldest month is -11° , the warmest 50° , a range of 61° . The highest temperature on record at St. Michael is 75° , the lowest -55° , a range of 130° . The contrast with the Pacific coast is still greater in the matter of rainfall, which at St. Michael is very light, amounting to only 14 inches annually. Moreover, rain falls in the warm rather than in the cold season.

The temperature of this coast is not much modified by the sea. Bering Sea is practically a closed sea, the Aleutian Islands forming a partial barrier against the warmer waters of the Pacific; consequently its waters retain, to a large extent at least, the temperature incident to the latitude. Its mean annual temperature is little affected by outside influences, and the greater part of it is frozen for half the year. The extremes of temperature, however, are reduced by the slow absorption and radiation of heat, just as with the Pacific. As this region is north of the territory of the prevailing westerlies, the winds have no preva-

lent direction, but blow whithersoever they list. For the same reason the rainfall is light, and though the air over the sea is saturated with moisture, little of it drifts over the land to supply rain.

If there is a region more infested with fogs than the Pacific coast of Alaska it is Bering Sea. Here fog is the normal condition, and clear, bright weather the rare exception. It is no uncommon experience for vessels bound for the Pribilofs to miss the islands in the fog, and to spend days searching for them, as for needles in a haystack. They are a small target to shoot a vessel at from Unalaska, 250 miles away, and once missed, are easily lost in this great foggy waste.

The climate of the great interior region is that common to the interior of all continents. The mean annual temperature is practically the same as in the same latitude on the coast of Bering Sea, but the range of temperature is much greater. It is warmer in summer and colder in winter, since the land heats and cools much more rapidly than the sea. At the point where the international boundary crosses the Yukon River the mean temperature of the coldest

month (in 1889) was -17° , that of the warmest month 60° , a range of 77° . Contrast these figures with those given above for Sitka, where the corresponding range was only 26° . Furthermore, consider that the mean temperature of the warmest month on the Yukon, in latitude $64^{\circ} 41'$, was 4° higher than at Sitka, over 500 miles farther south. These figures are instructive in pointing the conclusion that if any part of Alaska can become of agricultural importance it is the interior rather than the Pacific coast. But it is doubtful whether even this region will admit of profitable farming. In connection with this question the experience of the Canadians is instructive. On Peace River, in latitude 56° , 600 miles farther south, many and persistent attempts at farming have been made, but without financial success, although it is doubtless true that certain crops have been matured there.

The extreme range of temperature in the interior is surprising, even to those accustomed to roast by day and freeze by night in our western deserts. At this same point on the Yukon, temperatures of -60° and of 87° have been recorded—a range of 147° . Again con-



Eskimo at Plover Bay, Siberia

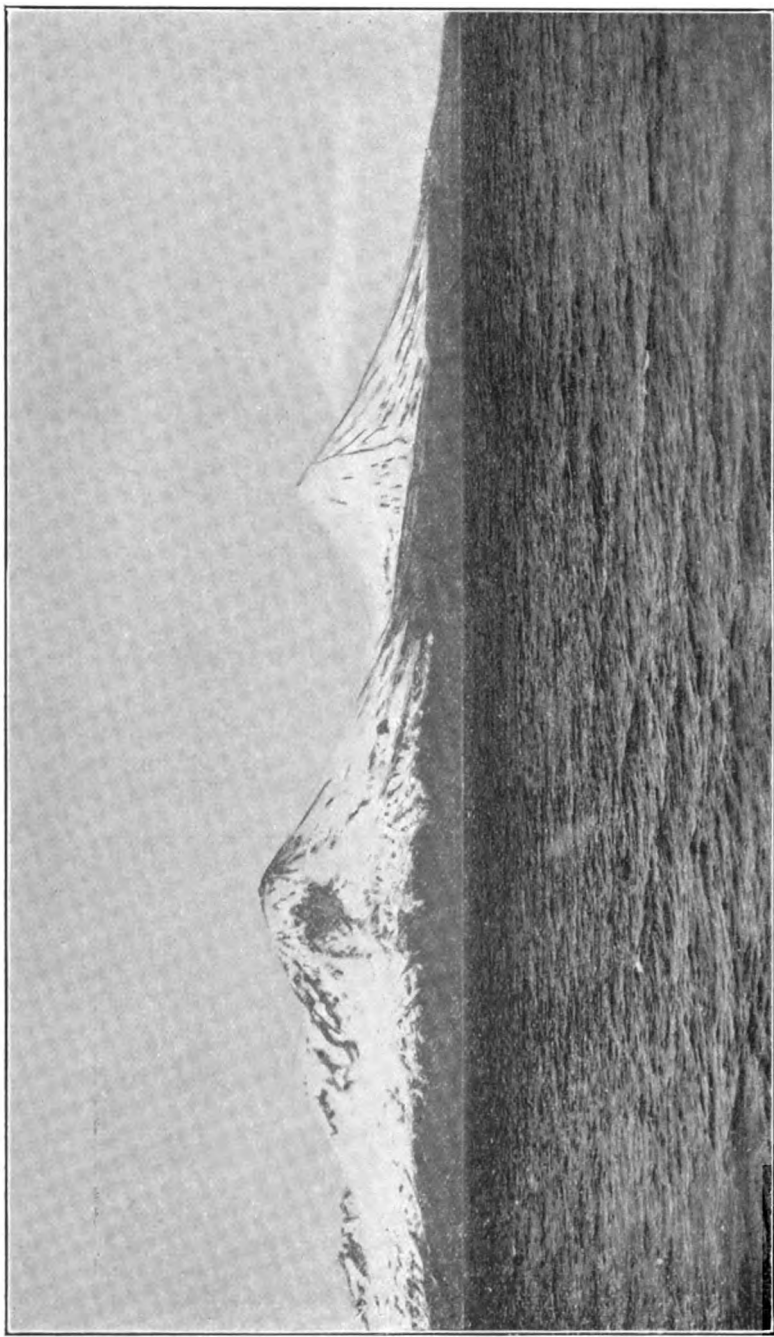


Photo by C. Hart Merriam

Mt. Paulof, Alaska Peninsula

trast this with Sitka, where 90° is the extreme range record.

The rainfall in the interior is light, ranging at various places and in different years from 10 to 25 inches. With the cold climate and consequent slight evaporation, it is probably sufficient in the majority of years for agricultural requirements. Differing radically from the coast climates, this climate is bright and sunny. There is little dull, cloudy weather and practically no fog. There is more sunshine here in a month than at Sitka in a year.

FORESTS

The coast, as far to the westward as Cook Inlet, is densely forested up to the timber line, which ranges with the latitude from 3,000 to 2,000 feet above sea-level. The timber is mainly, indeed almost entirely, Sitka spruce. There is some hemlock at higher levels, and in the southern part a little cedar also, but these are of little commercial importance. Red or Douglas fir, which forms the bulk and principal value of the forests of Washington, disappears in British Columbia. The spruce is large and fine, as judged by eastern standards, but as compared with the timber of Oregon and Washington, which is the standard on the Pacific coast, it is inferior, and little use is at present made of it, most of the timber needed being brought from Puget Sound. On Kadiak and the adjacent islands there is little timber, and farther west on the Alaska Peninsula and the Aleutian Islands none whatever, nor are there any trees on the islands in Bering Sea. Why the timber should thus suddenly disappear on the peninsula and islands is an open question. The rainfall is ample, and the climate little more severe than at Sitka and less severe than about Prince William Sound. The suggestion that high, cold winds prevent tree growth is negatived by the fact that such winds occur all along the

coast, in forested as well as non-forested parts. Moreover, the forest-fire fiend has not been here.

The interior of the Territory is forested mainly with spruce, as far north as the valley of Koyukuk, and as far westward as the delta of the Yukon. In this enormous region there must be an almost fabulous amount of coniferous timber, sufficient to supply our country for half a century in case our other supplies become exhausted.

POPULATION

The population of Alaska in 1900, according to the Twelfth Census, was 63,592, having nearly doubled in the preceding ten years. Of the total increase, 31,540, about three-fourths was acquired by that portion of the Territory lying north of the Yukon River, and only one-fourth by that portion south of that river, including southeastern Alaska. Half of the increase in northern Alaska consisted of the people of Nome, which had a population of 12,486, by far the largest aggregation of people anywhere in the Territory; the remainder were scattered widely over its great area, but mainly in the valley of the Yukon and along the coast north of the mouth of that river.

In southern Alaska the population increased almost everywhere, but not by any means at as rapid a rate as in certain localities in northern Alaska. Skagway had a population of 3,117; Sitka, 1,396; Juneau, 1,864; Douglas, 825; Wrangell, 868, and the Indian village of Metlakahtla, 465.

Of this total population about 25,000, or a little more than two-fifths, were Indians, Eskimos, or mixed bloods, the remainder being whites. The increase during the past ten years probably consists entirely of whites.

The population is in high degree a floating one, with the slightest possible attachment to localities, and subsequent

censuses will doubtless show radical changes in its location.

RESOURCES

The natural resources of Alaska are enormous. The skins and furs, the fish, the gold, copper, and coal, and the timber of the Territory are in value almost beyond calculation, and the mere reaping of this harvest sown and ripened for us by nature will occupy an industrial army for many years. The wealth thus collected will add greatly to the well-being and happiness of our people.

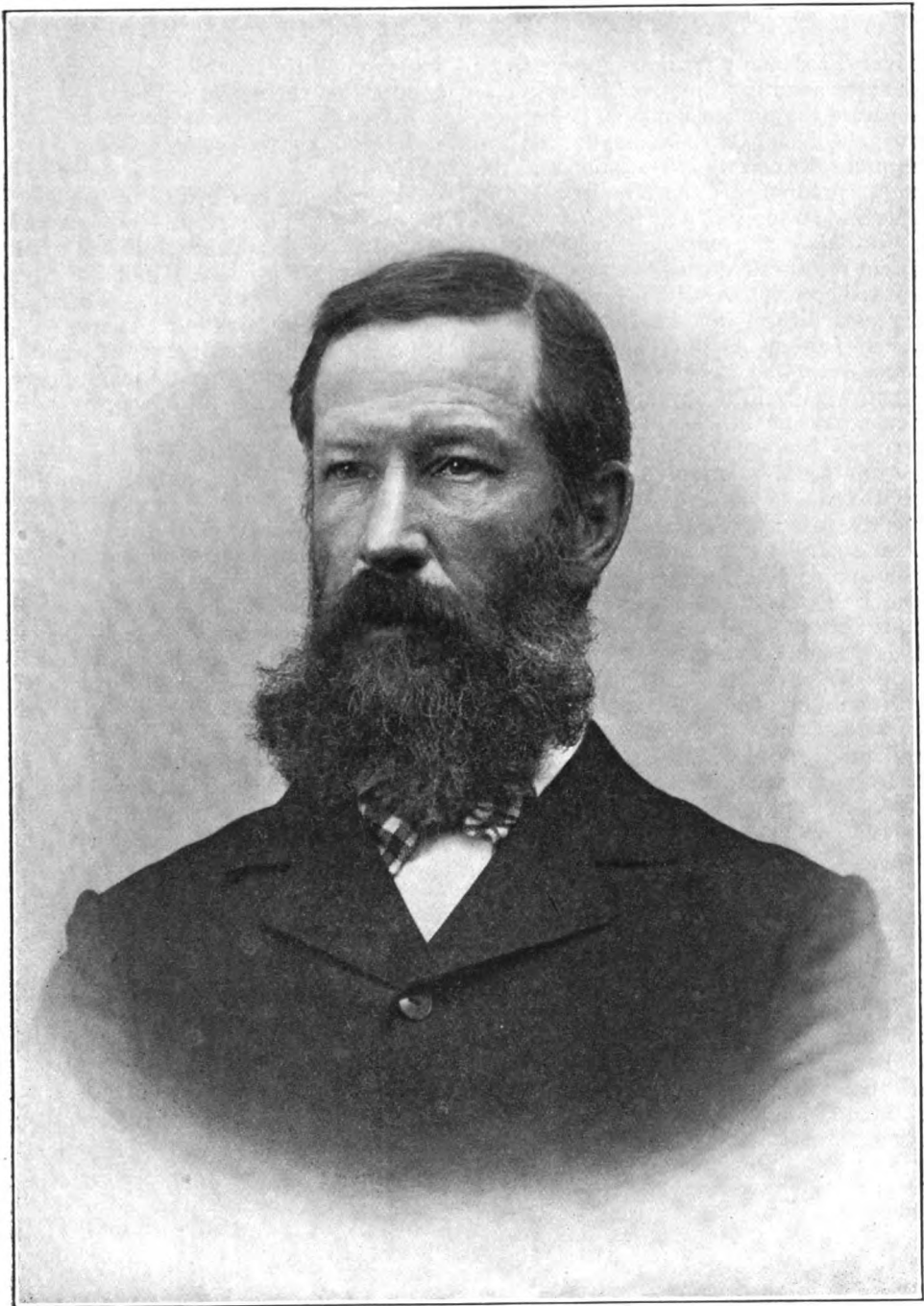
Some of these natural resources, however, have begun to suffer from the drain to which they have been subjected. The gathering of furs and skins, which has been in progress since the early Russian occupancy of the Territory, has been prosecuted so actively that the fur trade is now of comparatively little consequence. Blue foxes are now so valuable that systematic attempts are being made to breed them for their skins. The sea otter has become very rare, and the value of skins correspondingly high. The fur-seals, on account of pelagic sealing, are now reduced to a small fraction of their former number, and only 24,000 skins were obtained at the seal islands in 1899. Even the great brown bear has become scarce and shy, and hides in the fastnesses of the interior, away from the seaboard, where he was formerly abundant.

The sea-birds, once plentiful all along the coast, are now driven to the rarely visited parts, where, particularly on the islands of Bering Sea, they may yet be found by millions.

Fish are still abundant, but with salmon canneries springing up all along the coast, it is probable that the demand will soon make perceptible inroads upon the supply. During the year 1899 these canneries packed and shipped 1,100,000 cases and 25,000 barrels of this fish.

The mineral resources of the Territory

are yet in an undeveloped condition, but unless all signs fail, the chief wealth to be obtained from Alaska will be taken from the ground. Coal is known to exist in many localities, but is nowhere as yet mined on a commercial scale, owing mainly to its inferior quality; the coal in use at present is brought from Nanaimo or Puget Sound. Copper-vein deposits of great magnitude and richness have been found, notably on Copper River and the shores of Prince William Sound, but as yet none of them have been developed beyond the shipping of a few hundred tons of ore for testing. Gold deposits, both placer and vein, have been found in various places all over the Territory. They are so widely distributed and so rich as to lead to the conclusion that with more extended and thorough prospecting, the known auriferous areas will be vastly increased and the yield of the yellow metal multiplied many times. Some of the quartz mines, as the Treadwell, near Juneau, have been worked productively for many years. This mine alone has produced about \$10,000,000. Others have recently become productive, and still others, more numerous, are yet in the development stage. The mines near Juneau produced in 1899 gold of the value of nearly two million dollars. At several localities in southeastern Alaska and on the Shumagin Islands quartz mines have been discovered, but at present placers are far more abundant. They have been found on many of the tributaries of the Yukon, especially on those from the south, the Sushitna, the Kuskokwim, and the Koyukuk, and in the north, the Ambler and the Noatak. At several places gold has been found in the beach sands on the seashore, and last, but by no means least, on the beach and the stream-beds at Cape Nome and Port Clarence. These last discoveries seem to be the greatest of the whole northwest, rivaling and probably exceeding the great Klondike dis-



Henry Gannett

covery, for many millions appear to be in sight awaiting the pan or rocker to separate the golden sand. The harvest of gold from Cape Nome during the summer of 1900 was \$6,000,000 and the total product of the Territory from placers in 1899 was \$1,200,000.

But after the enumeration of these latent resources of the Territory few are left to describe. Alaska is not a country for agriculture, nor for home-making. It has paid us its purchase price many times over, and in the future will pour much wealth into our laps, but it will never pay, as other accessions to our territory have paid, in making homes for our people. At present few people go to Alaska to live; they go there merely to stay until they have made their stake.

Farming as a business is impossible under the climatic conditions prevalent on the coast. It is granted at once that it is possible to mature certain hardy crops in favorable seasons, but this is quite a different thing from raising crops in competition with California and the Willamette Valley, even when the cost of freight is added. It must be done at a profit or not at all. It is of no avail to raise potatoes when they can be brought from Portland and sold for less than the cost of production in Alaska. If there is any part of the Territory in which farming can be successfully carried on, it is the interior, which has a much more favorable summer climate than the coast; but even there success would be doubtful. However, as the higher rate of freight to the interior will have the effect of a protective tariff on home products, it may be possible to raise grain and vegetables at a profit

under conditions which would be prohibitory on the coast.

SCENERY

There is one other asset of the Territory not yet enumerated—imponderable and difficult to appraise, yet one of the chief assets of Alaska, if not the greatest. This is the scenery. There are glaciers, mountains, and fiords elsewhere, but nowhere else on earth is there such abundance and magnificence of mountain, fiord, and glacier scenery. For thousands of miles the coast is a continuous panorama. For the one Yosemite of California Alaska has hundreds. The mountains and glaciers of the Cascade Range are duplicated and a thousand-fold exceeded in Alaska. The Alaska coast is to become the show-place of the earth, and pilgrims, not only from the United States, but from far beyond the seas, will throng in endless procession to see it. Its grandeur is more valuable than the gold or the fish or the timber, for it will never be exhausted. This value, measured by direct returns in money received from tourists, will be enormous; measured by health and pleasure, it will be incalculable.

There is one word of advice and caution to be given those intending to visit Alaska for pleasure, for sight-seeing. If you are old, go by all means; but if you are young, stay away until you grow older. The scenery of Alaska is so much grander than anything else of the kind in the world that, once beheld, all other scenery becomes flat and insipid. It is not well to dull one's capacity for such enjoyment by seeing the finest first.

GEORGE M. DAWSON

IN the death of Dr. George M. Dawson the Dominion of Canada has sustained a great loss in the domains of geographic science and of affairs, for Dr. Dawson was not only one of her leading scientific men, but took an active part in her political matters.

Dawson was born at Pictou, Nova Scotia, in 1849, his father being the



George M. Dawson

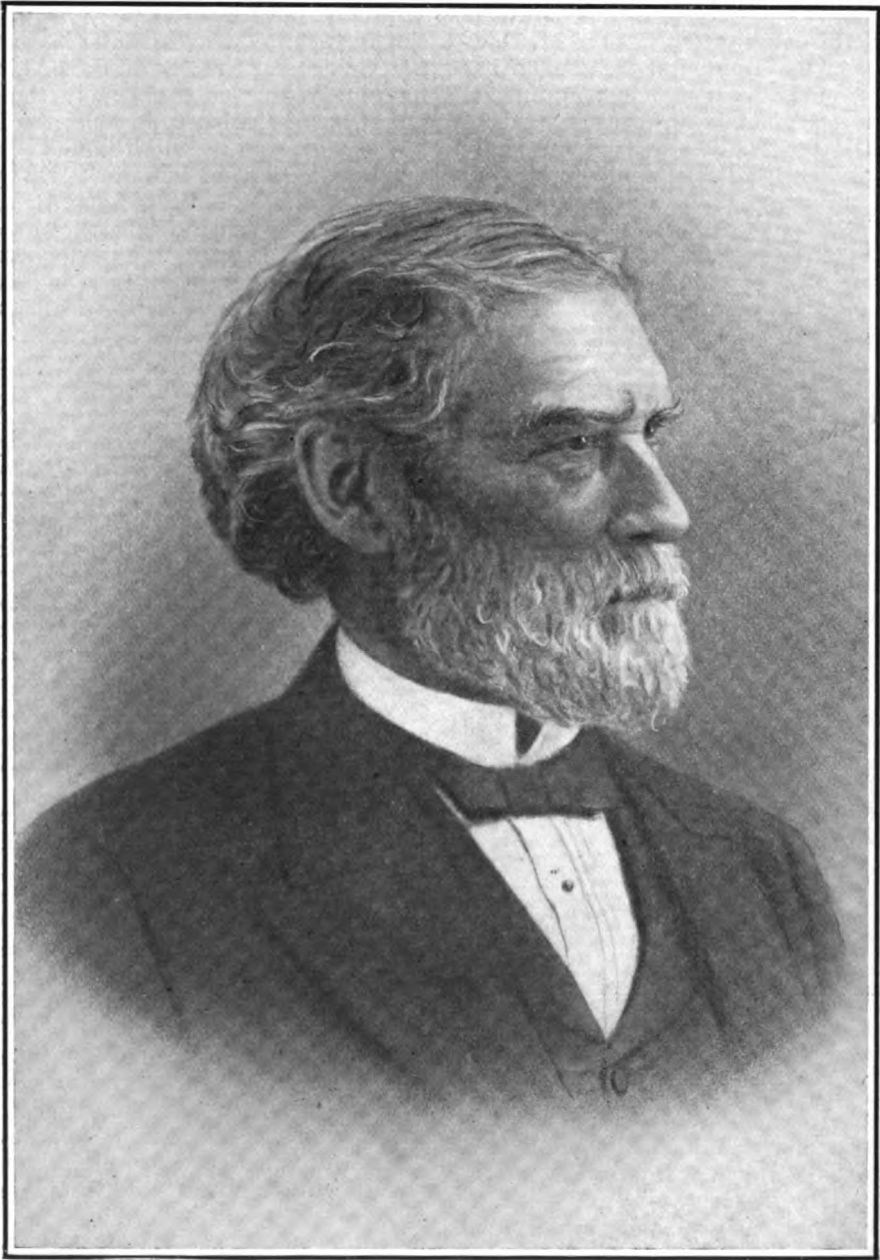
celebrated geologist, Sir William Dawson. After a thorough training at McGill University and at the Royal School of Mines of London, he commenced his long career of geographic and geologic explorations as geologist and botanist on the Northwest Boundary Commis-

sion in 1873. Two years later he joined the Geological Survey of Canada, and for nine years was engaged in the exploration of British Columbia, the Yukon Valley, and the high plains of the northwest. While his work was primarily geological, still we owe to him, more than to any other explorer, our present knowledge of the northwestern part of North America. In 1883 he was appointed assistant director of the Geological Survey, and in 1895 became its director, which position he held until his death, on March 2, 1901.

During his quarter century of active work many duties were imposed upon Mr. Dawson and many were the honors he received. In 1891 and 1892 he served on the Bering Sea Commission, and for his services received the order of Companion of St. Michael and St. George. In 1891 he received from the Royal Society of England, of which he was a fellow, the Bigsby medal for his researches in geology, and degrees were conferred upon him by Queens College and McGill University. In 1893 he was elected President of the Royal Society of Canada.

Dr. Dawson's work was mainly that of an explorer, and for that he had, in spite of his physical defect, wonderful ability and fitness. To draw broad and accurate generalizations from the slight data obtained by the explorer requires close observation, great breadth of vision, and high reasoning powers, and in the selection of Dawson for this work the Canadian authorities made no mistake. He has laid down with great accuracy the leading geographic and geologic features of the Canadian Northwest, and thus constructed a skeleton on which future work will supply the details.

H. G.



George Davidson

GEOGRAPHIC NOTES

ALASKA

THE narrative volume of the famous Harriman Alaska expedition of two summers ago will appear during the present month. Through the courtesy of Dr. C. Hart Merriam, editor of the volume and of the Harriman publications, the NATIONAL GEOGRAPHIC MAGAZINE is able to present in this number one chapter from this remarkable work—The General Geography of Alaska, by Mr. Henry Gannett.

So rapid has been the exploration of this vast territory during the past five years that few realize the extent of present knowledge of the country. Mr. Gannett, in his paper, gives the most comprehensive statement of the general geographic features as developed by recent exploration that has yet been published.

The narrative of the Harriman expedition is the most trustworthy and at the same time popular work on Alaska which has ever been offered to the public. Mr. John Burroughs opens with the story of the two months' travel of the Harriman party. Mr. John Muir follows with a chapter on the Glaciers. Then Mr. George Bird Grinnell describes the Natives of the Alaskan Continent—the Indians and Eskimo. Dr. Wm. H. Dall gives the History of the Discovery and Exploration of Alaska. Mr. Charles A. Keeler has a chapter on the Birds of Alaska, Mr. B. E. Fernow on the Forests, and then follows Mr. Gannett's article on the General Geography of Alaska. Dr. Merriam contributes the concluding chapter on the Volcanoes of the Aleutian Archipelago. The bird pictures by Mr. Louis Fuertes, the plant pictures by Mr. Walpole, and the fiord scenes by Mr. Dellenbaugh form a notable feature of the volume. Twenty colored plates, over 100 full-

page photogravures, and 200 insets illustrate this splendid work. Messrs. Doubleday, Page & Co., of New York, are the publishers for Mr. Harriman.

ANDORRA AND SAN MARINO

THE two states which look strangest upon the map of Europe are the tiny Republics of Andorra, in the eastern Pyrenees, and of San Marino, in northeastern Italy. Each owed its original independence to its strong natural position; then for centuries the shrewdness of its inhabitants knew how to play off one enemy against another. In modern times its neighbors have seemed to feel a sort of chivalric sentiment for it because it has taken care of itself so long.

The Republic of Andorra has existed since the eighth century. When the Moslems invaded France from Spain in the eighth century that little territory in the mountains was not conquered by them and has remained independent ever since. It now enjoys the joint protection of France and of the Spanish Bishop of Urgel. Its extent is less than 175 square miles. Its hardly more than 6,000 inhabitants are almost all miners and farmers. It is governed by a representative council of 24 persons, who are chosen by the heads of families.

The Republic of San Marino, though having a population of about 10,000, is only one-fifth as large in area, but is still more ancient. In fact, it is the smallest and the oldest independent republic on the globe. It is governed by a Great Council of 60 members and a Minor Council of 12 members. It has an army of 938 men, and spends about \$10,000 annually on internal improvements. On June 28, 1897, San Marino concluded a formal treaty of friendship with Italy.

GEOGRAPHIC NAMES

THE following decisions were made by the U. S. Board on Geographic Names, April 3, 1901:

- Aowa; creek, Dixon County, Nebraska (not Aoway nor Ayoway).
 Apple; group of islands in northern part of Sitka Sound, southeastern Alaska (not Iabloshni, Middle, nor Sredni).
 Basket; bay indenting the southeastern shore of Chichagof Island, southeastern Alaska (not Kakagin nor Kook).
 Bendel; island between Big Koniui and Nagai Islands, Shumagin group, Alaska (not Morse).
 Bois d'Arc; creek, Ellis County, Texas.
 Bois d'Arc; creeks (two), Choctaw Nation, Indian Territory.
 Bois d'Arc; post-office, Greene County, Missouri.
 Bois d'Arc; river in northern Texas.
 Bois d'Arc; township, Montgomery County, Illinois.
 Broad; island near the junction of Hooniah Sound and Peril Strait, southeastern Alaska (not Crosswise nor Poperetchni).
 Buncombe; creek, Chickasaw Nation, Indian Territory (not Boncombe).
 Cacaway; island and point, Langford Bay, Kent County, Maryland (not Cacawa).
 Camp Coogan; bay in eastern part of Sitka Sound, southeastern Alaska (not Camp Cogan, Camp Kogan, Kadiak, nor Nachlezmia).
 Cliffs; point, Chester River, Kent County, Maryland (not Cliff City, Cliff's, nor Starts).
 Comet; peak, Pinal County, Arizona (not Camels nor Comets).
 Eyak; lake and native village at western edge of the Copper River delta, Alaska (not Eyack, Eyuk, Ighiak, Ikhiak, nor Odiak).
 Fryingpan; cove, Eastern Neck Island, Kent County, Maryland (not Boxes nor Frying Pan).

Glenhaven; post-office, railroad station and township, Grant County, Wisconsin (not Glen Haven).

Hauani; creek, Chickasaw Nation, Indian Territory (not Haiyona nor Hiayona).

Hound; island in northern part of Keku Strait, southeastern Alaska (not Round).

Inner; point on the southeastern shore of Kruzof Island, Sitka Sound, southeastern Alaska (not Rocky nor Second).

Koip; peak and ridge on boundary between Mono and Tuolumne Counties, California (not Ko-it).

Leechville; post-office and village, Beaufort County, North Carolina (not Leachville).

Leevining; cañon, creek, and peak, Mono County, California (not Leevining nor Vining).

Luppatacong; creek in Keyport, Monmouth County, New Jersey (not Lupatcong, Lupatcong, nor Luppatacong).

North Gabouri; creek, Ste. Genevieve County, Missouri (not North Gabor nor North Gabori).

Oraibi; post-office and village, Navajo County, Arizona (not Oraiba).

Piute; peak and post-office, Kern County, California (not Pah-ute, Pahute, nor Paiute).

Rockhall; district No. 5, Kent County, Maryland (not Edesville).

Shoshone; * river, tributary to the Big Horn River, Big Horn County, Wyoming (not Stinking Water).

* The legislature of the State of Wyoming passed an act, which was approved February 14, 1901, as follows:

"Be it enacted by the legislature of the State of Wyoming:

"SECTION 1. That the name of the stream of water known on the map of the United States as the Stinking Water River, situated in Big Horn County, Wyoming, and emptying into the Big Horn River, is hereby changed to the Shoshone River, and shall hereafter be designated and known as such.

"SEC. 2. This act shall take effect and be in force from and after its passage."

Scraggy; islet in Salisbury Sound, south-eastern Alaska (not Samoilof).

Shoals; point, the southeastern point of Kruzof Island, Sitka Sound, south-eastern Alaska (not First, Low, Nizmennia, Otmeloi, Outer Point of Shoals, nor White's).

Smoke; creek south of Buffalo, Erie County, Pa. (not Smokes).

South Gabouri; creek, Ste. Genevieve County, Missouri (not South Fork Gabor nor South Gabori).

Turner; island between Big Koniui and Nagai Islands, Shumagin group, Alaska (not Stierfeld).

Wapsipinicon; river in eastern Iowa (not Wabes-pinicon Wapsie nor Wapsiepinnecon).

West Point; city, militia district, and post-office, Troup County, Georgia (not Westpoint).

West Point; district, post-office, and town, King William County, Virginia (not Westpoint).

Wosnesenski; island off south shore of Alaska Peninsula and west of Unga Island, Shumagin group, Alaska (not Crested, Peregrebnoi, Unat-kuyuk, Vozoychenski, Vossnesenski, nor Wossnessenski).

Yucaipe; creek and valley, San Bernardino County, California (not Yucaipa).

GERMANY IN CENTRAL AMERICA

THE rapid increase of German commercial interests in Central America has recently led Germany to appoint her first salaried consul to Central America. The consul has been accredited to Nicaragua, as the probable construction of the canal across the Isthmus will make it the most important of Central American countries.

The trade between Germany and Central America annually reaches from \$7,140,000 to \$11,900,000. German companies practically control the entire shipping of the coast, and \$59,500,000

of German capital is invested there in real estate, industrial enterprises, and in banking houses. German farms and plantations cover more than 742,000 acres, on which are planted 20,000,000 coffee trees. Much of the trade of Central America goes abroad instead of coming to the United States, owing to the fact that American houses do not employ in their establishments persons speaking Spanish, and refuse to give credit.

A SUBMARINE ARCTIC BOAT

A UNIQUE submarine boat is now being built at Wilhelmshaven, Germany, designed not for war, but for the search for the North Pole. Herr Anschütz-Kämpfe, of Munich, the inventor, recently described his plans at a meeting of the Vienna Geographical Society.

The boat will be capable of descending to a depth of 160 feet, and of swimming at that distance from the surface, and can remain fifteen hours under water. The vessel is in the form of an ellipsoid of rotation, the major axis being 70 feet and the breadth 20 feet. Its cubical contents will allow sufficient air for five men for fifteen hours, the carbonic acid gas being removed by combination with caustic soda. The boat is kept from rising by vertical screws of five-horse power, and is propelled by horizontal screws of forty-horse power. A petroleum motor supplies the necessary power.

When ready for the start the boat will be towed to the edge of the ice near Spitzbergen, about 600 miles from the Pole. The inventor's argument for the rest of the journey is as follows: The polar ice, on the average, reaches to a depth of 16 to 20 feet, but when packed it may reach to a depth of 80 feet (land ice in the form of icebergs, which extend several hundred feet below water, may, he thinks, be disregarded in this

region). The extent of ice-fields rarely exceeds three miles, and as the vessel can make three miles an hour under water and can remain fifteen hours, he believes there will be no difficulty in swimming from opening to opening of the ice-fields. The possibility of meeting reefs of rock rising toward the surface or of sand banks he considers so slight as to be disregarded.

If after proceeding six hours under water the vessel finds no opening it will rise to the ice and search for a thin spot, and if blasting cannot effect an outlet there will be plenty of time to return to the last opening.

WORK IN THE ARCTICS IN 1901

NOT since the years of the Franklin search expeditions has there been such activity directed toward the north and south polar regions as during the present year. Not less than eight expeditions are now in the far north or are planning for active work in Greenland, Spitzbergen, and Franz Josef Land, and of these, five—Baldwin, Peary, Sverdrup, Bernier, and Anschütz-Kämpfe—are aiming for the North Pole.

Peary passed his third consecutive winter in the vicinity of Smith Sound, and is now probably sledding toward the Pole. In July the Peary Arctic Club of Brooklyn will dispatch for the third time a relief ship to carry him supplies and to bring him back if he this year reaches his goal. If unsuccessful he remains another year. Peary is not yet informed that the Duke of Abruzzi last year eclipsed Nansen's record. Mrs. Peary, with her little daughter, went north in the Peary relief ship of 1900, hoping to join her husband.

Sverdrup's plans for this summer are a mystery, as they were in 1900. He is probably pegging away in northeastern Greenland. He also has passed his third consecutive winter in the far north, but no vessel has taken him supplies in

the meantime, and probably he will be obliged to return in September.

Baldwin inaugurates the most important arctic expedition of the year. The primary object of the *Baldwin-Zeigler* party is avowedly to get to the Pole. Scientific work is secondary, but the equipment of the party is so complete that much valuable data will undoubtedly be obtained. Prof. J. Howard Gore, the well-known physicist of Columbian University, accompanies Mr. Baldwin as far as Franz Josef Land, where he will spend the summer in work, and return on the second ship, the *Fridtjof*. The names of the scientific men who will remain permanently with the party have not yet been announced.

Mr. Baldwin intends to make some interesting experiments in the matter of food. He is taking a quantity of desiccated potatoes; also quantities of "fruit bricks," with which the Department of Agriculture has experimented so successfully. Bushels of strawberries, raspberries, etc., can thus be compressed into solid form and retain their freshness until used months later. Four hundred picked Siberian dogs will be taken, which is four times as many as the Duke of Abruzzi had with him and twelve times the number Nansen took. The bottoms of the kyaks and sled-runners, which were constructed in Norway, are lined with German silver, which Mr. Baldwin believes will afford the best protection against water and ice.

The *Amerika* and *Fridtjof* will steam north together as far as the ice permits, when the stores of the *Fridtjof* will be transferred to the *Amerika* and to a convenient point on Franz Josef Land, and the smaller ship returns to Tromsø.

A Russian Party, on a vessel of the type of the ice-breaking *Ermak*, will push northward as far as the powerful vessel can crush its way. A large staff of scientists will conduct observations during the trip, as the main purpose of the expedition is scientific. The *Ermak*,

with boilers under half pressure, can force her way through polar ice of 12 to 14 feet thickness at a rate of nearly 3 knots an hour. This type of vessel may prove an important factor in ultimately reaching the pole.

Captain Bernier, of Quebec, has adopted essentially the plan Nansen has urged of approaching the Pole from Bering Sea, between 165 and 170 degrees east longitude, and then drifting toward the Pole. Captain Bernier does not expect to set out this year, but is making arrangements for an expedition to start in 1902.

The widely circulated statement that the **Duke of Abruzzi** would send a special vessel northward in July to search for the three members of his party who were lost in Franz Josef Land in March, 1900, is unfounded. The whaling steamer *Capella*, which every summer goes northward, toward the end of July will stop incidentally at Franz Josef Land to see if it can find traces of the missing men, but the Italian prince has no connection with the plan.

Walter Wellman has purchased a whaling steamer in which he hopes soon to lead a third arctic expedition. The party may start this year or wait till the summer of 1902.

The project of **Herr Anschütz-Kampfe** of attaining the North Pole by means of a submarine boat has been alluded to on page 201.

WORK IN THE ANTARCTICS

PLANS are under way for five expeditions to southern regions, two of which—the English and the German—set out in July, in costly ships specially constructed for the purpose.

The *Discovery*, the first ship ever constructed in England for purely exploratory work, was recently launched on the Firth of Tay. The *Discovery*, which is the vessel of the **English Antarctic Expedition**, is the sixth of her name in

the annals of British exploration. The first *Discovery* carried Hudson to Hudson Bay in 1610, on the ill-fated voyage when his crew mutinied and abandoned him in a tiny boat to perish on the great bay which he had discovered. The second of the name one hundred years later made a voyage to Hudson Bay. The third was the second ship in Cook's third voyage, in which he discovered the Hawaiian Islands, only to be murdered there a few months later. In the fourth Vancouver explored the Gulf of Georgia and the shores of the island which bears his name—1791-'95, and the fifth was the second ship of the Arctic expedition of Sir George Nares.

The present *Discovery* is as staunchly built as experience and science can make her. She is a combined sailing and steam vessel, with engines of 450-horse power, and will be able to steam about eight knots an hour. At the water line she is 170 feet in length, with an extreme breadth of 33 feet; her mean draft is 16 feet and her displacement 1,750 tons.

Captain Scott will have under him four other officers, two of them belonging to the navy and two to the Royal Naval Reserve. The second in command will be Lieutenant Armitage, whose three years' experience in Franz Josef Land with Jackson should be of immense service, especially if he is placed in command of a land party. There will be three civilian scientific specialists and two medical officers, both of them qualified to undertake certain departments of scientific work. The petty officers and crew will number about 25, so that the complete complement of the *Discovery* is not likely to exceed 40. There will be some 20 sledges and 20 dogs, some of the sledges being light enough to be easily drawn by men.

The *Gauss*, for the **German Antarctic Expedition** (named after the Göttingen professor who did so much to stimulate

Antarctic research), was launched at Kiel early in April. The German ship, like the *Discovery*, is built mainly of wood, the only material which is elastic and strong enough to resist ice pressure and the boisterous seas of the south polar regions. She is some twenty feet shorter than the English vessel, but is broader, and her displacement is 300 tons less. The crew will consist, in addition to Dr. von Drygalski, of four scientific assistants, a captain, a first officer, two mates, an engineer, ten seamen, six assistant engineers and stokers, a cook, and a steward—28 in all. Each of the officers has a cabin to himself, while the crew have four large rooms. All the dwelling-rooms will be heated by steam, and it is calculated that a temperature of 50° Fahr. will be maintained within when that outside is as low as —22°. Electric light will be provided throughout practically the whole ship, and an acetylene apparatus may possibly also be installed. Laboratories and other special arrangements are provided for scientific work, while, as in the British ship, dredging and sounding apparatus have been provided. Dr. von Drygalski is planning to take 50 dogs. He, as well as the English captain, has included a balloon in the equipment.

A map showing the routes of the English and German expeditions was published in this Magazine, in No. 8, vol. x. The English expect to establish a station on Cape Adare, Victoria Land, which will be the base of their land parties, while the Germans plan to make their base on some point in Wilkes Land. Each vessel will carry sufficient stores for 3 years, as it is probable that each party will remain that time within the Antarctic Circle.

The Swedish Antarctic Expedition, under Dr. Otto Nordenskjöld, has engaged the *Antarctic*, the vessel with which Dr. Nathorst made his notable explorations on the east coast of Greenland in 1899. This party may possibly

leave in September, but the chances are that they will not set out until 1902.

Plans for the **Scottish Antarctic Expedition** are progressing. This expedition will probably not set out until the year 1902.

The **Duke of Abruzzi** is organizing a south polar expedition to start in June, 1902. He is enthusiastically supported by all Italians.

AN AMERICAN FLOATING EXPOSITION

THE suggestion for a floating exposition made by the Chief of the Bureau of Statistics of the Treasury Department in the February number of this magazine has aroused much discussion not only throughout the United States, but in other parts of the world. Mr. Austin has received letters from various countries in Europe asking about the proposed enterprise, and many inquiries from manufacturers and merchants in the United States desiring to participate in an undertaking of this character.

This suggestion of Mr. Austin has been followed by the announcement that a floating exhibition, to visit the cities bordering upon the Gulf of Mexico and Caribbean Sea, has been organized at Buffalo, and will leave in the autumn of the present year for that field. A number of other enterprises of this character have also been suggested.

The Bureau of Statistics has received the following statement, published in the *Moniteur Officiel du Commerce* (Paris, March 28, 1900), regarding a floating exposition recently organized in Hamburg, Germany:

"The earliest exhibition of this kind was organized about two years ago, and it must be said that the results of the enterprise were in excess of the most sanguine expectations: Total value of transactions, 22,000,000 marks (\$5,236,000), at a cost of about 800,000 marks, or about \$190,400. The details of opera-

tion are stated by the correspondent as follows :

"The syndicate addresses to manufacturing and commercial firms circulars explaining the purpose of the exhibition and the terms of participation. As soon as the number of would-be participants is large enough to permit the loading of a vessel, the exhibitors send their samples to the port of departure. These samples are then mounted and exhibited on board the vessel, especially fitted for this purpose.

"By each exhibit there is an advertisement giving prices and terms of sale. Sales agents representing either the syndicate or the individual exhibitors furnish all desired information to the visitors at the various ports where the vessel stops. These sales agents are chosen from among the young men, as well as the young women, graduated from commercial schools and speaking at least two languages. Interpreters are hired on the spot in each country of a new language. The sales agents, besides seeing visitors aboard the ship, visit also with their samples the towns in the interior of the country. In such manner the cost of transportation is greatly reduced.

"The exhibitors pay to the syndicate a commission, to be deducted from the realized sales and in proportion to the value of the product. In addition to this commission, the participants pay a proportionate share of the cost of chartering and loading the vessel and the general expenditure of the undertaking, such as the hire of clerks, interpreters, etc."

"The report concludes with the expression of the hope that French commercial circles would appreciate this novel idea and try to achieve even more splendid results."

Announcement of an Austro-Hungarian floating exposition to leave Trieste this month for a voyage around the world was made in the preceding number of this Magazine.

POPULATIONS OF AUSTRIA-HUNGARY, DENMARK, AND SWITZERLAND

THE figures for the census of Austria-Hungary, taken in December, 1900, show an increase for the past ten years of about 10 per cent, a more rapid growth than the dual kingdom has experienced for several decades. The population is about 46,890,000, which makes her the seventh country in the world in population. Those outnumbering her are China, the British Empire, the Russian Empire, the United States, France, and the German Empire. Japan has a million or two less.

The Danish census was taken February, 1901, and shows an increase during the last eleven years of 12½ per cent, which is greater than in any recent decade. This increase is mainly due to the diminishing number of emigrants and to the decrease in the death rate, brought about by the efforts of the government to prevent the spread of consumption. As in the other countries of Europe, the people are moving into the towns. The towns show an increase of 28 per cent, while the country districts show an increase of only 4 per cent. The present population of Denmark is 2,447,441.

The census of Switzerland, taken December 1, 1900, gives the population of the republic as 3,312,551, an increase of 13.5 per cent during the twelve years since the preceding enumeration.

THE CONQUEST OF CHINA

"I KNOW not in what fable I have read about some fishermen who had disembarked upon an unknown island and had already begun to set up their tents and to sow their grain, feeling great pride in their unexpected acquisition, when, all at once, they found themselves hurled into the water—they and their implements—so that the greater

part of them were drowned. They had set foot upon a huge slumbering whale, which had subsequently waked up when the first incursions had been made on his body by the newly arrived occupants.

"This is a fable, but I fear it may become history when it is applied to the mistaken calculations of the European powers as to the occupation of China."

Thus Cesare Lombroso in a recent contribution to *The Evening Star* (Washington, D. C.) describes the Chinese problem. He believes that the Chinese are a different, not an inferior, race; that they are now lazily dormant, but will soon be exasperated by European oppression and excited to fearful rebellion that will wreck everything foreign in the empire. He agrees with M. De Bloche, the famous Russian advocate of international arbitration and the inspirer of the Peace Conference, that there is a still greater peril, namely, that when the Chinese have been badgered and harassed beyond even Chinese patience, as a last resource they will throw themselves into the arms of Japan. Such an alliance would menace the rest of the world, for Japan loves Europeans only so long as she can learn from them.

The Manchurian Railway the Russian Government hopes to complete during the current month, states the American consul at Moscow. Working trains are already running between Onon, Harbin, Vladivostok, and Port Arthur. Thus in a few weeks trains will run from St. Petersburg to Port Arthur with only one small break—the few miles around Lake Baikal, where heavy boats ferry the cars across the lake. A map showing the route of the Manchurian Railway was published in No. 8, vol. xi of this Magazine.

The Survey of Greece, which has been interrupted since the Greco-Turkish war, is to be resumed this spring under the

direction of Heinrich Harti, a professor at the Vienna University. Professor Harti was summoned to Athens last autumn to inspect and take charge of the topographical bureau which he founded some years ago. It is feared that the cadastral survey by communities which has been ordered will not be successful, as the people object to the demarkation of boundaries. Professor Harti, however, hopes to be able to make a general survey of sufficient accuracy to make a map of the whole kingdom on a uniform system.

Explorations in Alaska.—The U. S. Geological Survey will send this summer three important expeditions for exploratory work in Alaska. The first, under W. J. Peters, will start from Bergman, nearly 1,000 miles northwest of Sitka, and proceed to the Arctic Ocean. The party hopes to advance eastward as far as the British boundary, and then will turn westward again and proceed toward Point Barrow. The second party, led by W. C. Mendenhall, the geologist, will work around Kotzebue Sound. The third party, led by Mr. Gerdine, will continue previous explorations in the region of the Copper River.

The War Department sends no expedition to Alaska, as its resources are fully occupied by Cuba, Porto Rico, and the Philippines.

The Biological Survey of the Department of Agriculture will send this summer parties to the region of Athabasca Lake and the Great Slave Lake to determine the zones of distribution of the fauna of that country. Mr. Preble, who so successfully led the party from the Survey to the Hudson Bay country last year, has charge of the work. Dr. C. Hart Merriam, the chief of the Survey, continues his study of the zones of distribution of the fauna of California.

The new director of the Geological Survey of Canada is Dr. Robert Bell,

formerly the senior member of the staff of the Survey. Dr. Bell, since he joined the Survey, in 1857, has made surveys, both topographical and geological, in almost every section of Canada.

Three expert geologists of the U. S. Geological Survey are now engaged in making an examination into the mineral resources of Cuba. The work is very important, and may result in much economic value to the island. It was undertaken at the suggestion of Governor-General Wood, and all of the ex-

penses will be met by the Cuban government.

The U. S. Coast and Geodetic Survey has five parties in Porto Rico charting the coast of the island. This work has now been in progress for two years, and great advance has been made in obtaining accurate charts of the coastline. Several local harbor charts of the Hawaiian Islands are being published by the Survey, the result of surveys made in 1899 and 1900.

GEOGRAPHIC LITERATURE

Where Black Rules White: A Journey Across and About Haiti. By Hesketh Prichard. Illustrated. 8vo, pp. [i-xi +] 1-288. New York: Chas. Scribner's Sons, 1900.

Made attractive by a tasty symbolic binding, clear type, thick and large paper, fair half-tone reproductions of photographs, and excellent press-work, this book is a convenient outline of its writer's knowledge concerning one of the most interesting portions of the western hemisphere—the only considerable portion which has ever reverted from Caucasian rule to the dominion of an alien race. The fifteen brief chapters are based mainly on the observations of a single visit; although interesting historical details are interwoven here and there, there is nothing in profession or performance to indicate that the author was inspired by the instincts of the historian, and much to indicate that he was not geographer or geologist, naturalist or artist, ethnologist or sociologist, economist, or even serious student—but just a tourist bent on writing a book. So the chapters are light if not frothy, the expressions youthful if not flippant; yet the vocabulary is remarkably rich and the word-painting singularly vivid, and

the narrative smacks of the soil throughout. The author pays tribute to Toussaint L'Ouverture as the one noble figure in Haytian history, but shows that the bloodthirsty Dessalines is the local hero; he summarizes the history of black rule as one of steady lapse from civilization to barbarism if not to savagery, and is correspondingly pessimistic as to the future of the island; he ascribes the progressive degradation partly to the incompetence of the masses, partly to the corruption of the classes, but mainly to the persistence of the Vaudoux cult with its depressing beliefs and ghastly ceremonies running down to serpent-worship and human sacrifice. The book is material for knowledge of Haiti—material rather meager and tenuous, perhaps, but direct, useful, and happily dressed.

W J M.

China. By James Harrison Wilson. Third edition. With map. 8vo, pp. xxxvii + 1-422. New York: D. Appleton & Co. 1901.

For many years General Wilson's work on China has been a standard authority. The third edition includes an account of the Boxer War and of the diplomatic conferences of last fall.

General Wilson believes that Japan will be forced to follow the lead of the three great European powers—France, Germany, and Russia—in all Chinese questions. Russia occupies an impregnable position, and will dictate her policy to France, and thus indirectly to Germany. A few hundred years from now, General Wilson believes that "universal empire will have its nucleus and seat" in China, as her "coal measures and iron deposits are commonly believed to be the most extensive and the most enduring in the world." That it will be an empire of white men and not of yellow men is the author's unhesitating conviction.

The Land of the Moors. By Budgett Meakin. Illustrated. 8vo, pp. 464. New York: The Macmillan Co., 1901. Mr. Meakin was for some years editor

of the *Morocco Times*, and is the author of a number of reliable books relating to the Moorish Empire—"The Moors," "The Moorish Empire," etc. The present volume deals more especially with the geographic features and the history of the exploration of Morocco. There are good chapters on the Physical Features, Mineral Resources, Vegetable Products, and Animal Life. The book is timely, as "the land of the Moors" will probably be the center of much diplomatic warfare during the next decade. The apparent alliance between Italy and France undoubtedly has some bearing upon the ultimate fate of the country. The author believes that "France is the normal heir to Morocco whenever the present empire breaks up," and thinks that England should make up her mind to the inevitable fact.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY

Meetings.

April 12, 1901.—The annual reception of the Society was held in the parlors of the Arlington Hotel. Mr. Paul Du Chaillu was the guest of honor of the Society, and gave some interesting reminiscences of his life. The official, diplomatic, and social life of the Capital were the guests of the Society during the evening.

April 19, 1901.—President Graham Bell in the chair. The new by-laws for the Society, submitted and recommended by the Board of Managers, after a full discussion were unanimously adopted. The by-laws and the reasons for their adoption were published at length in the April number of this Magazine (pp. 167-'8).

Announcements.

The President announced at the meeting April 19 that the plans for the building which is to be the headquarters of the Society are advancing, and that it is hoped in a few weeks active work will be commenced.

THE ANNUAL EXCURSION AND FIELD MEETING of the Society will be held at Brandywine, Del., Saturday, May 18.

As the fiscal year of the Society will hereafter begin the first of January instead of the first of June, the Board of Managers have voted to fix the dues of members for the seven months which intervene between the end of the present fiscal year, May 31, 1901, and the beginning of the next fiscal year, January 1, 1902, at \$1.

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THE NATIONAL GEOGRAPHIC MAGAZINE

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honor is given to many others and claimed by more. Hwangti's capital was in Honan, and he is described as extending the empire from Pechili to the Yangtze, while his son even extended the boundaries into Manchuria on the north and Tonkin on the south.

He is given the credit of originating the famous "Cycle of Cathay," the arbitrary period of sixty years, in honor of the sixty-first year of his reign; and he established a regular calendar. But a greater deed was the regulation of weights and measures according to the decimal system. He carried the same principle into the government of his kingdom, making ten towns one district, ten districts one department, ten departments one province, and ten provinces one empire. He built highways upon land, and boats to navigate the rivers, and generally was a wise and progressive monarch.

He was following in the footsteps of Fuh-hi, who instituted the laws of marriage and methods of agriculture and fishing.

The lyre and lute were invented by him to make his people cheerful and content. Chinese characters were devised and family names were then first known.

While all these stories of providing the necessities and of adapting the realities of life suggest a degree of truth, there is woven in with them a large measure of romance that colors their historical value. Fuh-hi attributed all his successes and glorious achievements to the dragon-horse that came out of the Yellow River bearing a scroll on its back, and possibly in this fable we have the crystallization in legendary history of the dragon conception, which plays so important a part in contemporary Chinese romance and reality—which adorns their flags and clothing, is the central figure of their art, and is remembered in their prayers.

But the glory of Fuh-hi and Hwangti

is overshadowed by the renown of that galaxy of Chinese heroes, the Emperors Yao, Shun, and Yu, whom Confucius and Mencius, China's two greatest sages, have made immortal. Yao and Shun reigned approximately B. C. 2350–2200, and their names and deeds are known to every Chinese boy and girl. The child of mandarin or coolie will glibly describe their greatness, as the son of millionaire or pauper in America will tell you about Washington or Lincoln.

It is well to note in this connection that the characters which are admired and remembered in China today as in the past are generally men of highest attainments and lofty motives. The sterner records of history tell of evil as well as good men, but the popular narratives, songs, and poems, together with the deep philosophic works of China's wise men, give little consideration to other than the great and good. Thus has there been a continuous and notable influence for the development and betterment of the Chinese peoples from the earliest times, which has had a marked effect upon the life of the empire through its ups and downs of the past centuries. It elevates the Chinese far above and beyond any position as barbarians. It demonstrates the existence of a powerful civilization more years before the birth of Jesus of Nazareth than have elapsed since that chief event in all history startled and amazed the pagan world.

After Yao and Shun came the mighty Yu, during whose reign were two events that will never allow it to sink into entire oblivion. The first was the terrible inundation of the greater part of the then inhabited empire by China's sorrow, the Yellow River. The second was the discovery of the manufacture of wine. Which has been the worst for mankind might be difficult to determine! Yu, after he had enjoyed his first experience with the beverage, sagely remarked, "The days will come when

some of my successors, through drinking this, will cause infinite sorrow to the nation." Yu was the founder of the Hia or Hai dynasty, which controlled China from 2200 to 1818 B. C.

The records of Chinese historians are not definite in naming the year when the Chinese settlers first arrived in their new home, but it was in these early semi-legendary years. By some the time is placed before the days of Fuh-hi or as contemporaneous with his reign. Others contend that they came about 2500 B. C., antedating the reign of Yu; but nearly all agree that the Chinese were not natives. They came, if we are to take the word of Confucius, from the valley of the Euphrates or from the regions of the Caspian Sea. Journeying for a new land and home, they persisted in their eastern pilgrimage by a northern route and entered China through the valley of the Hoangho or Yellow River, until finally they were stopped by the boundless waters of the Pacific.

The fact that the Chinese were not indigenous adds vastly to interest in the study of the growth of the empire. It establishes a degree of sympathy on our part with their history that we might not otherwise feel. The present dominant American race were not aborigines; we drove the latter unmercifully before us and ruthlessly took possession of this continent. So the Chinese, entering their new field of effort, gradually drove before them the natives until now there are left only small numbers of the aborigines, who have their home and rendezvous in the fastnesses of the southern mountains. The Chinese seem to have begun their empire with isolated bands of colonists in the northern, central, and western provinces of Shensi, Shansi, Honan, and Hupeh, just as the first Europeans established themselves in Massachusetts, Virginia, and Florida. Now they reach over an area larger than that which is under the sovereignty of the American people.

The mighty Hia dynasty was doomed to end through the very means that Yu predicted. It went out in debauchery and unbridled voluptuousness, under the lead of vain Kieh-Kwei, and of his beautiful but wanton consort, Meihi.

The dynasty of Shang then assumed power, and 28 sovereigns occupied the throne through 644 years. These kings were good and bad, strong and weak, and the empire prospered and suffered, extended and contracted, according to the character and power of these men. If we will pause and think what a period of 644 years and 28 monarchs means, and yet what little impression they made on history beyond a passing record of the usual wars, cabals, and strifes, we are in a mood to appreciate how trifling a portion of history's long story the present exciting times may occupy in the minds of the future historians.

RECUPERATIVE CHARACTER OF CHINESE

Let us remember, however, one consideration that augurs well for China in the future, as it has figured conspicuously to her advantage and in her growth during both the clear and the misty centuries of time that is gone: the end of the majority of the dynasties has come under the reign of evil or weak minded men and women, when it deserved to end and when it was best for the people and kingdom that a change should be inaugurated, and with few exceptions the succeeding monarchs have been men of eminent ability and leadership. This recuperative feature of China—of her dynasties, kings, and people—which has been illustrated repeatedly through fifty centuries or seventy-five cycles, may prove her salvation in the present crisis. No other nation in the history of the world has successfully mastered the events of centuries like China. If the principle of the survival of the fittest is demonstrated as logical and true in the

unlimited past competition of peoples and governments, and has kept China in the front as an independent power, will not its application in the future be attested by a newer and greater China rising out of the trials and confusion of the hour? With such an evolution of events, the policy of our Government of friendly assistance to China would seem all the more wise, and fraught with favorable results alike to Cathay and America.

THE GOLDEN AGE IN CHINA'S ANCIENT HISTORY

Out of the darkness shall come light. From the haze of the Shang dynasty was born the incomparable Chow dynasty, which boasted of thirty-five rulers and lasted through nine eventful centuries, from B. C. 1122 to 255. This period was a golden age in China's ancient history. It was the bridge between the doubtful past and the actual present. But its crowning glory was the appearance of Confucius and Mencius upon the stage of the world's history; nor should Laotze, the founder of Taoism, be omitted. He figured in the same dynasty, but his work was not so much for the bettering of his fellow-men as were the teachings and example of Confucius.

When we discuss at the dinner table, in lecture-rooms, and in social and literary intercourse the golden ages of Greece and Rome we are prone to forget entirely that in China there was a corresponding age, when real civilization in its broad sense reached a mark as high even as it did in southern Europe. It began in strength, blazed into unparalleled brilliancy, and then sank into decadence, to be followed by a period when the dregs of misfortune were drunk by the people; and such was the record also of European and western Asiatic powers.

If the founder of the Chow dynasty,

Wu Wang, were alive today he would be the man of power, ability, and leadership to save China. He found the empire in a more deplorable state than Kwangsu, the present ruler, when he ascended the throne. He made it respected throughout Asia. Embassies came with tribute from Korea on the north, Cambodia and Siam on the south, and Tatar and Tibet on the north and west. But in his power he made one cardinal error: he established the system of feudal states and feudal lords. Their struggles and wars were the influences which eventually wrought the downfall of his dynasty.

Singular enough, great national progress was made during these times of strife, and the boundaries of the empire were enlarged in proportion to the internal wars. The foundation was laid for the greater China that was to follow.

If nothing stood to the credit of the Chow dynasty other than the life of Confucius, it would have honor enough, without even including Mencius and Laotze.

CONFUCIUS AND HIS PRECEPTS

Confucius was born 551 years, or nearly six centuries, before Christ. Beyond a few myths and legends connected with his birth, there is nothing fabulous about his life. He stands out clearly as one of the greatest men that the world has ever produced. He was a man, not a saint; a man who went through the average experiences of a scholar and statesman in public life, and who in an unpretentious but sincere way endeavored to better his fellow-men. He gradually rose from low estate to be a magistrate, and finally became the prime minister of Duke Ting. He was an eminent lawyer, not unlike Moses or Solon, and was a practical philosopher like Benjamin Franklin. He was a man of the people and knew their impulses, hopes, and wishes like Abraham

Lincoln. It was because he understood man's nature that he was able to make such a lasting impression. The masses of China study his precepts today as they did twenty centuries ago and will twenty centuries hence.

Confucianism has its failings and weak points when regarded as a religion and must in the evolution of time give way as a religion to Christianity; but as the teachings of a great philosopher his works will never be forgotten. In fact they will have in some respects a wider hearing and following when the European and American world studies more the interesting and instructive history of Cathay.

Confucianism became a religion not through any intent or purpose of its founder. He never endeavored to start a religion, to be considered as a god, or as a prophet of a god. The doctrines, precepts, and philosophy of Confucius became a religion because they were purer and higher than the conceptions of any other religion that in those days was offered to the people; they were beyond and above the teachings of Laotze or Buddha in the mind of the average Chinese ruler or vassal. By natural evolution in the imagination of the people he became in a measure a god, but it is well to be remembered that he did not believe in any existing God, and there is no hint in his philosophy of a future life. When asked what was his opinion of death he replied: "How can one know death when one does not know life"?

To those who have firm belief in a living God and in the immortality of the soul, it would not seem that Confucianism could stand as a religion against the expanding influence of Christianity. No matter how much we admire the character and teachings of Confucius, there are lacking in his philosophy the two great essentials of faith and hope which are so dear to the Christian world. Charity there is in Confucius' teachings,

and that is a principal element in making them strong.

Love, respect, and worship of ancestors, which have played so important a part in China's political, material, and moral development, are fostered by the precepts of Confucius. His portrayal of the lives of the mighty Yao and Shun of the mythical days, and later of Wan Wang, Wu Wang, and Chau King, of the Chow dynasty, tended to develop a deep sense of ancestral homage. In the growth of China this influence has, on the one hand, protected the family and the state, and, on the other hand, retarded material progress. Worship of ancestors, with its virtues and faults, has been a synonym for conservatism in China. What was sufficient and satisfactory to their ancestors should be sufficient and satisfactory for the present generation! The fear, for instance, of disturbing the rest and peace of ancestors and of doing unpardonable slight to their memory has in a measure prevented the opening of the earth for its mineral and metals, has retarded invention, and in these later days checked such far-reaching enterprises as railway construction and further modern development of China's material resources.

If Confucianism is a religion, it is *the* religion of China; but Buddhism is also in a sense *the* religion of China, with Taoism, founded by Laotze, in a pronounced secondary position. Every Buddhist and every Taoist, however, is a disciple of Confucius to a certain degree, while a great number of the followers of Confucius are not Buddhists or Taoists. Every Chinese child is a student of Confucius. All of my Chinese servants could recite his principal precepts. They seemed to understand them also; but oftentimes they were in doubt about their real respect for Buddha and Laotze.

It is not within the scope or purpose of this paper to compare the teachings of Christ and Confucius; but in dis-

missing reference to such comparison it is interesting to remember the words of one distinguished savant, Dr. Legge. He says: "The teaching of Confucianism on human duty is wonderful and admirable. In the last three of the four things which Confucius delighted to teach—letters, ethics, devotion of soul, and truthfulness—his utterances are in harmony with both the law and the gospel."

Possibly the remarkable honesty of the Chinese as business men and merchants in dealing with foreigners, which has been a marked national trait in their commercial relations during the last sixty years, should be attributed to Confucius. Possibly it is due to native shrewdness; but it is so surprising to the average foreigner that it is worth recording here.

Mr. Thomas Whitehead, the distinguished manager of the great chartered bank of India, Australia, and China, which is the second largest banking house in Asia, says that his institution has never directly lost a penny through Chinese dishonesty in transactions representing many millions of sterling. The famous Asiatic foreign house or hong of Jardine, Matheson & Co. declare that they have lost more money to 8 per cent of foreigners than to 92 per cent of Chinese, in a total trade of 100 per cent, covering a period of nearly sixty years and representing one hundred millions sterling!

Mencius was a scholar, thinker, and philosopher second only to Confucius. His time is placed about 300 B. C. His teachings, moral deductions and precepts, epigrams, and wise sayings are studied and committed today by every native in China, and, next to Confucius, he has exerted a mighty influence on Chinese development.

Of the personal Lao-tze we know but little. He was a man of profound learning, but there has been handed down no such historical record or collection of his

writings as we have of his colleagues, Confucius and Mencius. His religion, Taoism, has at all times exerted a profound influence on China's history, but has never stood with the continuous strength of Confucianism. Some monarchs were entirely under its sway, while others decreed death to all who followed it. The original Taoism was perverted and changed, it was even assimilated by the Buddhism of China, for this variety is a corrupted branch of the old Indian stock. There was much in the early Taoism that suggested thoughts and ideas akin to Christianity. The immortality of the soul was partially pictured, though in a material, rather than in a spiritual, sense. In later days Taoism became the superstitious theory of magicians and of kings who would seek perpetual life through extraordinary elixirs and decoctions. Today it has many astute and devoted followers, but it is decadent as a religion and has passed long ago the day of its influence and power among the great religions of the world.

THE IMPORTATION OF BUDDHISM FROM INDIA

Buddhism in China is a transplanted product. It was brought from India as a sprig of one fruit might be grafted on the tree of another. Buddhism was grafted, in a measure, on Confucianism. It would never have thrived in China if Confucianism had been an actual religion like Christianity or if Confucius had been an inspired being like Christ.

Sixty years after the crucifixion of Jesus Christ the Emperor Ming-ti, of the Han dynasty, dreaming of a gigantic image of gold, dispatched an embassy to India to find a new religion. They returned with Buddhism. The doctrine of the transmigration of souls delighted the mighty Ming-ti. The rewards and punishments it outlined seemed reasonable, and the possibilities it pictured of

a future life supplied to him and his people what was lacking in Confucianism. Ming-ti was a practical, business-like monarch and went about the propagation of Buddhism as he did the promulgation of new laws and the collection of additional taxes. In that way it was given an impetus that enabled it to spread throughout all China. It undoubtedly tended to raise the moral standard of the people and nation, and hence was a direct influence on the growth of the kingdom. The Buddhism of today in China bears little resemblance to the purer Buddhism of Ceylon or Siam.

The King of Siam, who is the *ex officio* head of the Buddhist church of the world and one of the ablest and most progressive statesmen in Asia, often told me while I was the American Minister at his court, that the Buddhism of China was such only in name and was inextricably mixed with Taoism and Confucianism. The Chinese emigrant to Siam is at home in its Buddhist temples, but the Siamese who goes to China is not at home in Chinese temples.

There is a passing thought in this connection that almost staggers us. Supposing Emperor Ming-ti's embassy in search of a religion had journeyed to Palestine instead of to India and brought back Christianity? It taxes the imagination to picture the effect on China, on Asia, and on the world at large, if it had come in its purity. On the other hand, we are forced to ask with equal astonishment at the possibilities: What would have been the effect on Christianity if it had been taken in those early days by the Chinese as their official religion?

THE COMING AND EXPULSION OF CHRISTIANITY

But Christianity did come to China long before the day of modern missionaries. Christianity was taught and fostered for one hundred and fifty years

during the middle ages of China, between 600 and 800 A. D. The Nestorians, who taught the new religion to China, thrived for nearly two centuries, or until 781 A. D. About 1625 A. D. the famous Nestorian monument was unearthed in the province of Shensi. Williams, in his "Middle Kingdom," holds that the Nestorians came as early as 500 A. D. He says that the monument is "the only record yet found in China itself of the labors of the Nestorians," and yet it is one of the most perfect of the ancient monuments of China. The inscription tells us that a priest named Olopun came from the distant west, guided by the "azure clouds" of China, bringing with him the "True Scriptures." The emperor, one of the most powerful of the Tang dynasty, gave him a cordial reception and ordered the Scriptures translated and promulgated. In an official edict he said: "Let it have free course through the empire."

Unfortunately for its lasting influence it came under the ban which the Taoists, about A. D. 850, proclaimed against Buddhism through the agency of an hostile emperor. The effort to crush the Buddhists included the Nestorians, and only the monument remains. If sufficient time had passed for Christianity to have spread itself as had Buddhism, this one attack would not have ended its life in Cathay until again revived by American and European missionaries. It is an interesting coincidence that the Nestorians were apparently most severely persecuted in the same section of China where many American and European missionaries were recently massacred.

Before leaving the subject of religions I would add, in response to the general inquiry about missionary work, that I honestly believe, after six years' experience in Asia in both official and private capacities, and after spending much time in China, not only along the coast, but

in the distant interior, that the missionaries are doing far more good than harm, and that they should have the moral support of the American people in the continuance of their labors.

There are incompetent missionaries as there are incompetent business men. They have faults. These should and will be corrected and the work will go on. Missionaries will be a help and not a hindrance in the regeneration of China. The commercial spirit leading to ruthless territorial aggrandizement, manifested by the European powers, must bear the responsibility for the Boxer outbreak as much as the zeal of missionary evangelization.

Such men as Li Hung Chang, Sheng Liu Kin Yi, and Chang Chi Tung have told me unofficially that they had no objection to Christian missionary work where it was carried on by worthy men, but complained that too often indiscreet and incompetent men were in charge who excited hostilities and caused trouble for the majority of the missionaries who were qualified and successful.

This discussion of religions, into which I have gone to some length, although cursorily, began with a consideration of the character of the teachings of Confucius, who lived in the illustrious Chow Dynasty period. From the date of its ending, in 255 B. C., we pass on rapidly down through the long historical corridor of succeeding and changing Chinese dynasties. Some we admire; some we abhor. Some we praise; some we decry, but it is the same old story of ups and downs, great and little men, good and bad men, until we grow almost weary of the tale, and are constantly reminded that in the dim future these present days of critical negotiations at Peking may seem of little importance. Let us hope that their conclusion and results may warrant a higher measure of praise than we can bestow on many of the crises of the limitless but *fascinating* past.

THE GREAT WALL

During the Tsin dynasty, which succeeded the Chows, the major portion of the great wall of China was constructed. This was approximately 240 B. C., but some 250 or 300 miles of the wall were added nearly 18 centuries later, in 1547 A. D., by an emperor of the celebrated Ming dynasty. Let us remember what this means. A wall begun at one time two centuries before Christ was completed nearly sixteen centuries after Christ. Can anything better illustrate the great age and astonishing conservatism of China than this simple record? What are the sixty years of China's present modern foreign relations—one cycle of Cathay—in comparison with these eighteen centuries which history tosses up and off for our study as if only eighteen days!

The builder of the wall was, however, a great man. Some call him the Napoleon of Asia. Chung was his name, or Hwang-ti, as he called himself. He built magnificent palaces, constructed roads, dug canals, and did all in his power to make his kingdom mighty and prosperous, but was guilty of one unpardonable offense. Wishing to go down to posterity as the *first* king of China, he ordered the destruction of all the old records and libraries, and decapitated hundreds of scholars. For this he was never forgiven by the Chinese people, and few praises are now sung in his honor. Fortunately for China sufficient records were preserved, and literary men survived to replace later the destroyed records, legends, and histories. He was succeeded by the Han dynasty, which held sway from 206 B. C. to 225 A. D.

RELATIONS WITH THE ROMANS

The Han dynasty, that started before the Christian era and reigned into it over two centuries, saw the first commercial relations established with the Roman

Empire. The latter even sent an embassy to China, and presents were exchanged. Ptolemy and Pliny wrote of the Seres, a name which described the Chinese; and China was distinguished at times far apart by Sin, Chin, and Sinae. "The reign of the Seres was a vast, populous country, touching on the east the ocean and the limits of the habitable world, and extending west nearly to Imaus and the confines of Bactria," says Yule, adding, "It seems probable that relations existed from the earliest times between China and India, and possibly, too, between China and Chaldea. The 'Sinim' of the prophet Isaiah is by many taken to mean China, and the Ptolemys 'Sinae' are generally understood to have been the Chinese."

In the forty-ninth chapter, twelfth verse, the great prophet says, "Behold, they shall come from far: and, lo, these from the north and from the west; and these from the land of Sinim."

I referred to the honesty of the Chinese; that same story was told in Europe twenty centuries ago. Therefore the reputation of the Chinese for integrity, in spite of all that is said against them, has some good foundation. Justinian was the next great western writer who discussed the Chinese; and then Marco Polo, returning from the magnificent court and mighty empire of the imperial conqueror Kublai Khan in the thirteenth century, awoke the world to its first actual appreciation of the extent and power of Cathay.

The Roman Empire was often described by early Chinese historians as a nation with which China enjoyed trade exchange. The land of Tatsin-Kwoh was the name of this European kingdom in Chinese terminology.

While Rome was in the height of her glory and preparing the way for her downfall the Han dynasty was sailing on the flood tide of prosperity, great wars, territorial aggrandizement, and splendid material progress. When we

consider that such an eventful period is included in the records of Chinese history, we wonder that we have not given it more attention in our study of former civilizations. In those days we are told that temples and palaces were erected larger and grander than those of contemporaneous Rome and Greece; canals were dug of sufficient depth to float ponderous junks; walls were built that reached over high mountain tops; roads were opened that connected capitals and trade centers; wars were waged that killed millions of men, and peace and strife alternated from decade to decade. There was bloody civil contention among the feudal chieftains at one time, and then again a war of the entire united empire against a foreign enemy. The present Boxer uprising would have been treated in those martial days as an amusing incident, and no foreigner would have been spared to tell the tale and write lurid accounts for the magazines.

The contemplation of China's wonderful past suggests at once the question, Why, if such great deeds were done and such splendid buildings, palaces, and roads were constructed, are there not more tangible evidences remaining of these and later glorious periods? The answer is simple and conclusive. First, every new emperor, or the founder of each new dynasty, who was not friendly to his predecessor seemed prompted by an immediate and overwhelming desire to destroy all the signs of his predecessor's work and power, and proceeded to raze not only to the ground but obliterate all monuments of former glory. Secondly, there are remaining, even against such adverse conditions, more monuments of the past than are generally remembered in a discussion of this subject, such as the great wall, the Ming tombs, the Temple of Heaven, the Grand Canal, paved roads, great arched bridges, porcelain pagodas, and numerous lesser signs, like the Nestorian Monument.

Students of China will await, moreover, the new life in the empire and the opening of the interior in the hope that excavations in interior cities and the bringing to light of old records may tell us more than we now know and better explain and illustrate the conditions of the dazzling past.

China's famous competitive examinations were begun under the Hans; a penal code, the model of all subsequent ones, was drawn up, and, as before recorded, Buddhism was first introduced from India. The limits of the empire were extended until under the Western and Eastern Han dynasties they included Szechuan, Yunnan, and Fukien.

Romance tells its story of these times in the great Chinese historical novel entitled "The History of the Three States," which immortalizes in a halo of glory that period, which was at its height about three centuries after the birth of Christ. Every Chinese delights in this graphic story of valorous deeds.

We now pause at the threshold of the illustrious Tang dynasty, that shaped Chinese destinies for three hundred years, A. D. 618-907. To reach this period we pass the Tsin and Eastern Tsin dynasties, that succeeded the Hans and ruled for one hundred and fifty years with another group of fifteen monarchs. A few lesser dynasties followed, and then the first Tang began his beneficent sway. During this dynasty Korea became an acknowledged dependency of China, Siam sent tribute-bearers, and Persia sought aid from the Chinese Emperor in a war with other lands. It was one of the Tangs that welcomed the Nestorians. The canal system of China was extended, libraries were built, schools opened, and the people

were occupied peacefully and happily with agricultural pursuits for unusually long periods. The Hanlin Library and College was founded in 755, the writings of Confucius were newly annotated and revised, and poets, essayists, and historians thronged the courts of the emperors in place of eunuchs and concubines. But if preceding dynasties had been disgraced with beautiful and dissolute but powerful women, who controlled the empire by controlling their emperors and ministers, the Tangs had likewise the cruel and immoral but brilliant and able Empress Wu. She ruled China with a rod of iron and to the benefit of the people for fifty-four years.

Arab travelers who visited China in those days returned with stories of copper money, rice wine, and the use of tea as a beverage. Envoys of the Pope at this period sought to know more of China, and Mohammedanism also then first gained extensive entrance into China and became a factor in its development.

Looking to Europe, we find that England was then divided among the Saxon princes, and France and Germany were in that chaotic state which preceded the reign of Charlemagne. The discovery of printing is ascribed to this period, or about A. D. 581, nine centuries before Caxton introduced printing into England. In the siege of Tai-yuen, in the eighth century, gunpowder was used in cannon that threw 12-pound stone shot some 300 paces. After twenty emperors had reigned and China began to see the approach of a modern period of history, the Tang dynasty ended with a desolate land, ruined towns, and the capital razed to the ground by fire and vandal conquerors.

(To be concluded in the July number)

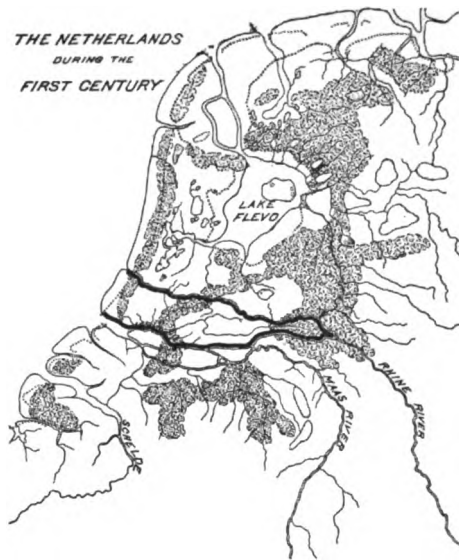
THE DIKES OF HOLLAND

BY GERARD H. MATTHES, UNITED STATES GEOLOGICAL
SURVEY

TO obtain an idea of the important role the dikes have played in the development of the Netherlands, and of the problems with which the inhabitants of that country have had to contend, it is necessary in the first place to understand how the soil of the Netherlands was formed, and what the peculiar conditions are that have rendered the existence of this unique little country possible. A few words concerning the geology of the region, which dates back to a time by no means remote, will therefore be of interest.

Geologically speaking, a large portion of the Netherlands may be said to have been formed only yesterday. This portion, which comprises the western and most interesting half of the kingdom, owes its origin to the alluvial deposits brought there by three large rivers—the Rhine, the Meuse, and the Schelde—the estuaries of which unite to form what at first glance appears to be a delta. The large amount of sediment discharged by these rivers, together with the action of tides and currents in the North Sea, were the primary causes of the formation of extensive series of sandbanks and bars off the coast, and as these banks grew higher and finally became exposed to the action of the wind at times of low water, there came into existence sandhills, commonly known as dunes. The coast in those days partook much of the nature of a “haff,” such as is found today on the German coast on the Baltic Sea, or along our own coast, notably at Pamlico and Albemarle Sounds. A long tongue of land running parallel with the coast inclosed a body of shallow water into which discharged

the three rivers. It is natural to suppose that after the formation of this haff, sedimentation progressed rapidly. Heavy deposits of clay gathered in its quiet waters, and later, as the haff grew more shallow and aquatic vegetation be-



came luxurious, extensive marshes came into existence, and the great peat beds which cover so large a part of the area of Holland at the present day were formed.

Interesting as are the successive steps in the formation of the country during those early days, space will not permit here to treat of them at length. Suffice it to be said that after the general level of the deposits had reached that of the sea, there arose vast forests, which at one time covered almost the entire country

of the Netherlands. The rivers found their way to the ocean through numerous tortuous channels, but there remained in the center of the country a small lake, called by the Romans at a later period "Lake Flevo." Thus the soil of the Netherlands, having been formed in part by alluvial deposits and in part by the formation of peat beds, cannot be called a delta formation, in the strict sense of that physiographic term, however much its appearance in a general way may resemble that of a delta.

The earliest records make mention of this region as a low, marshy, and heavily timbered area, protected against the tides of the North Sea by ridges of sandhills, and subject to flooding by both fresh and salt waters.

THE FIRST DIKE-BUILDERS IN HOLLAND

The first inhabitants of this inhospitable region were nomadic tribes of Germanic origin, known as the Catts and the Caninefates, and they must be regarded as the pioneers of dike-building. Though dwelling at first on the higher eastern lands of older formation, it is known that they finally settled in the lowlands, where, exposed to the constant danger of inundations, they soon learned to protect their lives and property by the building of levees.

Perhaps Holland in those days was not as undesirable a piece of land as it might prove in these days. At any rate, as early as 400 years before the commencement of this era, the Romans had begun its conquest, and were undertaking a number of improvements, the magnitude of which leave no doubt as to the value they put on their new acquisition. About 10 B. C. the Roman general Claudius Drusus, in order to relieve the Rhine of a part of its burden, connected it with the IJssel by means of an artificial canal, which may safely be said to have been the first canal dug by the hand of

man in Holland. According to Tacitus, the Roman general Germanicus, a son of Drusus, is said to have transported his army down the canal on floats constructed with the timber cut from the forests. Again, history tells us that the same general Drusus caused a levee to be built along the middle arm of the Rhine, in order to protect the province then called Bat-Aue ("good land") against the inundations caused in spring



The Netherlands of Today and the State of Ohio compared

by ice jams on the rivers. This same levee was completed some years later by general Paulinius Pompeus, and extended to the mouth of the Rhine at Katwijk, where there existed a gap in the dunes through which the Rhine discharged into the sea.

At some distance from its mouth, on the inland side of the dunes, the Romans constructed a large castle, known as Castle te Britten, and on an island in the estuary they erected a light-house, which bore the name of General Caligula. The castle is of interest because from the present location of its ruins important

conclusions may be drawn as to the shifting of the dunes. After having been sacked and burned by the Batavians, rebuilt again and destroyed once more by the Normans at a later date, the ruins of the castle were during the eighth and ninth centuries gradually covered by the shifting sands of the dunes, which were slowly being transplanted landward by the winds. The ruins disappeared and had been forgotten, when suddenly, after the severe storm of Christmas, 1520, they reappeared once more, but on the beach west of the dunes. Since that time they have in the course of centuries repeatedly been denuded and covered up again, and at the present day lie submerged in the sea.

RECESSION OF THE COAST LINE

It has been estimated from these facts that the dunes near Katwijk have migrated east a distance of two miles in about eighteen centuries. At other points along the western coast of Holland this receding movement has amounted to as much as six and seven miles during the same period.

It was not easy to put a stop to this alarming recession of the coast and consequent loss of land, together with the destruction of numerous flourishing villages. It has been permanently effected, however, by planting on the seaward side of the dunes a species of grass (*Arundo arenacea*), known in Holland as "Helm." This plant can sustain itself very readily in the finest and purest of sands by means of extraordinarily long and intricate roots, and is therefore well qualified to counteract the shifting of sand. The grass is planted by hand in tufts not quite two feet apart, aligned in rows. That this was a laborious piece of work needs no demonstration, when it is borne in mind that there extend along the coast of Holland a chain of dunes of a total length of 200 miles, varying in width

from 400 yards to three miles, while the elevations range from 60 to 200 feet above sea-level. In other places forest growth has been started on the dunes lying further inland, and the results have been very gratifying.

1,500 SQUARE MILES OF LAND SUBMERGED IN THE INTERIOR AND THE FORMATION OF ZUIDER ZEE

The retrogression of the dunes was a source of alarm; yet, on account of its slowness, the movement had not at first made itself manifest. Very serious changes had taken place, however, in the interior within a comparatively short period. Furious storms in the North Sea during the years 693, 782, 839, and again in 1170, 1230, and 1237 had caused a washing away of large sections of peat land situated between Lake Flevo and the North Sea. This wholesale destruction of land culminated in 1250, 1287, and 1295, when during the spring tides of those years Lake Flevo had become an inlet of the North Sea. It is estimated that this loss amounted to nearly 1,500 square miles of land, and submerged a number of flourishing villages. Heavy dikes were then built, inclosing the so-formed Zuider Zee, except at such points where it communicated with other bodies of water, in order to check all further encroachments on the land. Its form has since been practically the same as now appears on our maps.

With the advent of the fourteenth century began a period of active dike-building in Holland. Not only the Zuider Zee had swallowed much rich, arable land, but many of the interior bodies of water, at times of storms, were making similar trouble, and inundations caused by the large rivers were frequent. Obviously, as the country became more closely settled and land became more valuable, every new inundation caused more loss of life and property than had

previous inundations. These catastrophes, attended with the loss of thousands and thousands of lives, fill many a sad page in the history of the country. Dike-building became a serious matter and began to receive the attention which it had long needed. Flimsy dikes and levees were gradually transformed into heavier structures, and the physical outlines of the Netherlands were thus rendered more permanent and may be said to have suffered little change since that time.

The province of North Holland about the year 1288, although extensively protected by numerous dikes, was dissected by bodies of water of all sizes, such as the Schermer, the Beemster, the Purmer, the Starnmeer, the lakes west of Alkmaar, and the Langemeer, connecting with each other, and also with the Zuider Zee at several points. It was possible in those days to navigate from Amsterdam westward through the IJ, then through the lakes mentioned, and return by way of the Zuider Zee, without finding an obstacle in the form of a dike, or as much as a lock. With the expansion of Lake Flevo into a wide-mouthed inlet of the North Sea, the action of the dreaded tides and storms of the latter were carried into the very heart of the country, thereby raising considerably the levels in the lakes before mentioned and threatening new inundations. To remedy this dangerous situation, the three channels connecting the lakes with the Zuider Zee were closed by means of heavy dams during the years 1311-1400. In the main, however, the aspect of the country changed little between 1288 and 1575. Before the beginning of the seventeenth century there probably was felt little need of securing additional arable land; possibly pecuniary difficulties forbade the expenditure of the large sums required for draining the lakes, and more likely difficulties of a technical nature stood in the way. At any rate, the lakes drained during the fifteenth

and sixteenth centuries were few in number. About the middle of the fifteenth century windmills for raising water were coming into use in Holland. These were at first of a primitive character and of low power, but they were applied to the pumping out of lakes in process of reclamation.

RECLAIMING THE LAND

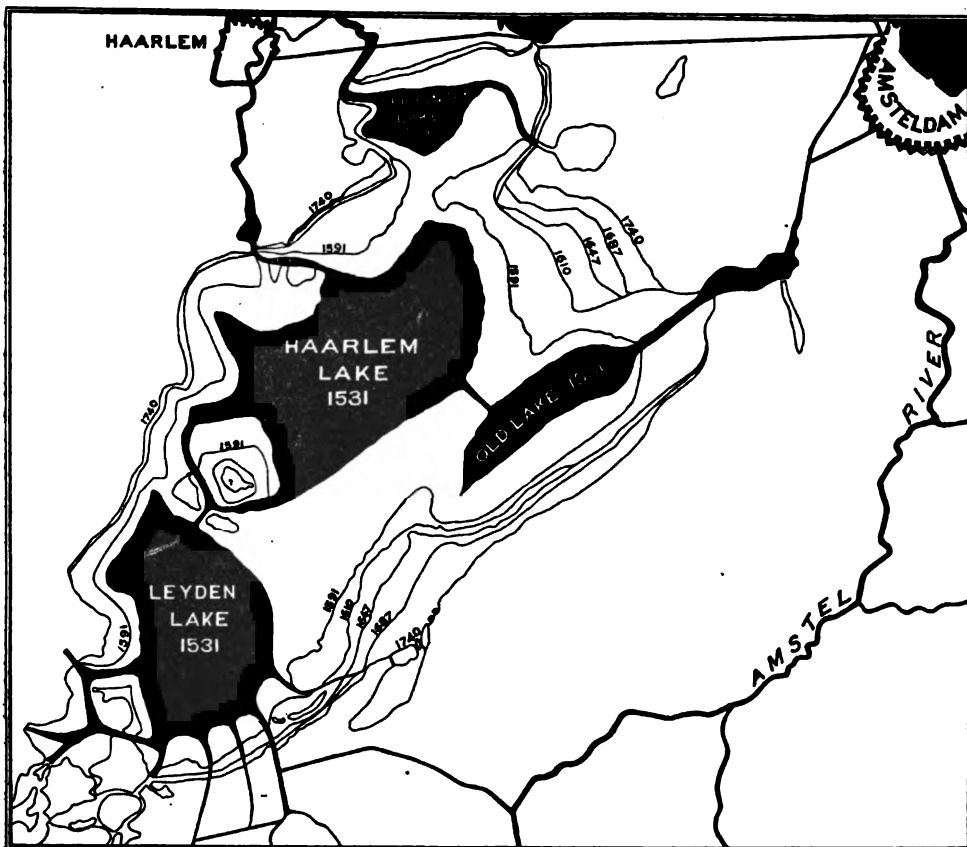
The great period for reclaiming land, however, did not begin until the early part of the seventeenth century, at a time when prosperity returned in Holland and great enterprises of divers character were begun. With the revived interest in agriculture and cattle-raising, the rich soils covered by the lakes became valuable, and every effort was made to drain them or to keep them within the smallest limits. This became urgent for the further reason that new lakes were constantly being created by the digging away of the peat for fuel. Between the years 1607 and 1643 sixteen lakes were permanently drained, adding to the territory of the Netherlands, within the space of 36 years, an area of 91 square miles, or nearly 60,000 acres.

All these lakes were drained with the aid of windmills. A lake was first inclosed by a dike to cut it off from surrounding bodies of water. This work was always of a difficult nature, consuming much time and money, as it frequently happened that during some storm the dike gave way. The inclosing dike once completed, the windmills, constructed in the meantime, commenced draining off the water into adjacent waterways. These latter were properly connected with each other to keep up the navigation in that section of the country and to carry off the water pumped out of the lake. Such a system of communicating waterways and canals is collectively known as a "bosom," and they in their turn dis-

charge the surplus water into the sea at times of low tide, while at times of high tide they are closed by means of locks. Even after the lake had been drained the same system was preserved, only less windmills being required to keep the lake bottom dry. In general, any section of land artificially drained, and known in the Dutch language as a "polder," has a "bosom" surrounding it, into which is delivered by the windmills all the water that collects in the polder. The polder, for this reason, is intersected by a network of ditches, carefully spaced and graded in such a manner as to drain the surplus moisture from the soil and conduct it to the windmills. The amount of ditching required to ac-

complish this as a rule covers an area equivalent to one-twelfth of the total area to be drained. Thus the Hollanders not only keep their polders dry, but provide at the same time ample means for navigation, the main canals and ditches being from 25 to 40 feet in width.

Before the invention of the steam-engine, windmills were exclusively employed in the work of draining the polders, but as the power of a windmill is rather limited, the lift was as a rule inconsiderable. In later years, when deeper lakes were drained, either steam-engines or series of windmills placed at successive levels had to be resorted to. Thus at the time of the reclamation of



Successive Enlargements of Haarlem Lake

the Beemster 49 mills were constructed, disposed as follows: 11 series of 4 mills each, 1 series of 3 mills, and 1 series of 2 mills. The work was commenced in 1608, when the dike was constructed, and the draining begun in 1612. The cost of this work amounted to \$760,000, the total surface thus reclaimed being 17,720 acres.

THE DRAINING OF HAARLEM LAKE

Since the invention of the steam-engine works of a greater magnitude were entered upon. Prominent among the latter is the draining of the Haarlem Lake. Originally there existed in this locality four small lakes, as the old maps of 1531 show us. In consequence of successive storms, which caused the destruction of the adjacent peat lands, the four lakes merged into one, and the new lake thus formed became a source of much anxiety. With the increased surface exposed to the action of the winds, the waves on the lake became more powerful, and large sections of peat land were bodily swept away. The four lakes in 1531 covered an area of 22 square miles, but their surface nearly doubled in 1591, when they merged together. In 1647 they covered 56 square miles; in 1687, 60 square miles, and in 1848, 65 square miles, or three times their original area. When during a storm in the fall of 1836 the city of Leiden was flooded by the waters of the lake, the situation became untenable and the government decided to drain the lake.

Between the years 1840 and 1846 the lake was inclosed by a dike 37 miles in length. Three powerful engines were built of from 380 to 400 horse power each, the largest one of which operated eleven pumps each 63 inches in diameter and with a lift exceeding 15 feet. With the aid of these engines the lake, which averaged 14 feet in depth, was pumped dry during the years 1847 to 1852, exposing 42,000 acres of excellent arable

land, for with the removal of the peat by the storms the rich alluvial clay underlying the latter had been laid bare. The government has felt itself amply repaid for the enormous sum of \$5,568,000 which was expended on this work. The sale of land yielded a revenue of \$3,142,800, and indirectly a great many incalculable advantages have been derived from it. (See map on preceding page.)

The last of the great works of this class that have been accomplished is the reclamation of the IJ, at one time an inlet of the Zuider Zee, and the construction of the large canal connecting Amsterdam with the North Sea. This work was completed in 1876 and the canal opened to navigation on November 1 of that year. Twenty-two square miles of excellent land were thus added to the kingdom. Space does not permit here of a description of the technical difficulties that were overcome in the construction of this magnificent canal, through which the largest sea-going vessels now pass daily on their way to and from Amsterdam.

LAND RECLAIMED FROM THE SEA

Next to their use in reclaiming land covered by fresh water, the dikes have been of great importance in reclaiming land from the sea. The province of Zeeland, which occupies the southwestern corner of the Netherlands, is composed of a number of islands, conspicuous for their fine agricultural lands and for the thrifty populations which they support. The larger part of this province has been formed by the hand of man out of the numerous shoals, claybanks, and sandbanks that existed here centuries ago. The archipelago of Zeeland, as well as some of the islands situated to the north of it, lie scattered in the broad estuaries of the principal rivers, and are consequently entirely alluvial formations. The fine silt carried in suspension by the rivers was de-

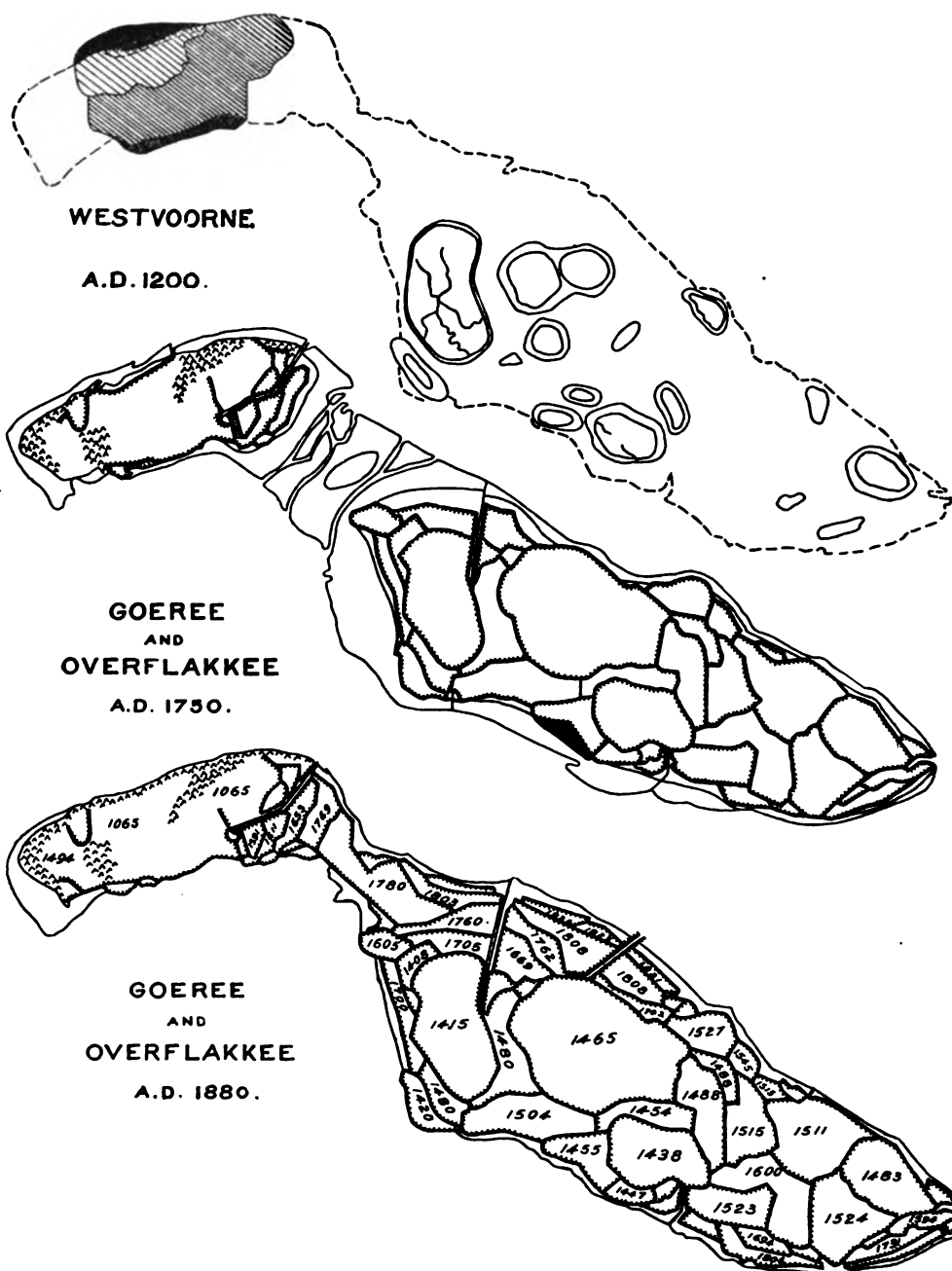
ZEELAND ABOUT THE YEAR 1200.



posited, building up the claybanks little by little, until they became exposed at low water in the shape of mudflats.

As early as the year 1000 enterprising individuals had begun to build small levees along the edges of these flats, in order to prevent the tides from washing over them, and gradually there arose from out of this shallow body of water a number of islands, the nuclei of the present archipelago. As the banks became larger, built up by the river deposits, aided by artificial devices for catching silt, new dikes were built further out into the sea, and the islands grew slowly as piece after piece was added to them. (See diagrams, p. 226.)

The growth of these islands is an admirable illustration of the untiring and steadfast persistency so characteristic of the Dutch people; for the work of reclaiming land from the capricious North Sea was fraught with much danger and tribulation. Again and again during severe storms the sea broke through the dikes and invaded the land acquired with so much painstaking labor, and in several instances areas were irrevocably lost. It must be remembered that this land was obtained by draining the water from an exceedingly humid, clay-like soil. This drying-out process, for such it really was, entailed as a natural result a shrinkage of the solid materials, which



These three Diagrams show the Enlargement of one small Mud Flat to ten times its original size

in many places has been very considerable. Lands that were at first at a level with tidewater have shrunk in the course of years from four to seven feet, until their level has sunk below that of mean low water. When the sea therefore succeeded in flooding such low areas, the possibility of their being reclaimed was practically forever ended. The shrinkage of the soil has manifested itself throughout Holland wherever clay and peat are encountered. It is therefore evident that the level of the land of the Holland of today is many feet lower than it was at the time of the Romans, when the first dike was built. The level of the provinces of Zeeland and Holland ranges between two and six feet below mean high water, while that of the drained areas is much lower, reaching a depth in some cases of 20 feet below mean high tide. Reclaiming land from flats in shallow waters has also been practiced in the northern provinces of Friesland and Groningen, though not as extensively as in Zeeland.

THE CHARACTERISTICS OF THE DUTCH DIKES

The problem of building dikes in a country possessing a soil which offers so little choice in the way of building material as does Holland is to any one but a Dutchman very perplexing. The country has not a single quarry, nor is loose rock available; the few woods that exist are being preserved with great care, and no timber can be cut from them for lumbering purposes. All that the soil of Holland offers is in the form of sand, gravel, and clay, for peat is worse than useless in construction works; and not only are the available materials poor, but suitable foundations upon which to erect dikes or, for that matter, any structures whatever, are totally absent. This is the problem that has been solved by the Dutch engineers through generations and generations of experience.

It is not within the scope of this paper to describe the many different kinds of dikes in use: their forms vary as circumstances require, and a lengthy discussion of them would lead into endless technical details. In brief, the principal features may be described as follows:

Compared with similar structures elsewhere, the Holland dikes are noteworthy for their great width; the river dikes are built with a crown, usually of from 15 to 20 feet wide, while the common type of the Mississippi levees has only a crown width of 8 feet, the height being about the same. The slopes are gentle, a common grade on the water side being three and a half to one, and on the land side two to one. A characteristic feature of the Dutch river dikes is what is technically known as the "banquette," a sudden widening of the dike near its base, which serves to reinforce the dike, and is specially designed to insure imperviousness where the hydrostatic pressure is greatest. The banquettes are built on either side of the dike, and vary in width from 10 to 30 feet. The larger river dikes range in height between 10 and 16 feet above the adjacent land, while the level of their banquettes is 8 feet below the top of the dike.

The materials used in their construction are sand and clay, and in the case of the ordinary dikes the water side is rendered impervious by means of a heavy layer of stiff clay. As a rule, no special preparations are made for the foundations, except where the soil is of a very treacherous character, when fascine mattresses laid in tiers are used, in very much the same manner as along the Mississippi. Wherever riprap or stone revetments are required, as, for instance, on the sea dikes, where the erosive action of the surf is considerable, basalt blocks brought from Germany are laid on heavy layers of brush. In many places piles are driven at the base of the sea dikes in order to break the violence

of the breakers. Nearly all masonry in engineering constructions is of Dutch brick, which is of a very superior quality. In breakwaters or piers, however, concrete blocks are used exclusively, as neither bricks nor basalt would furnish a bond strong enough to withstand the impact of the waves.

ENGINEERING PROBLEMS

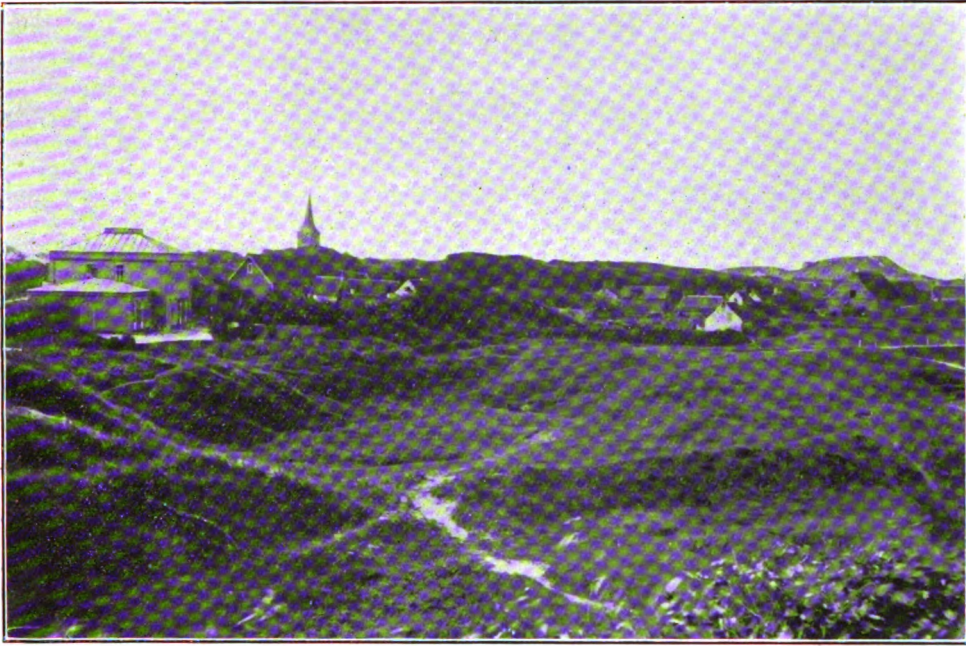
From a hydrographic point of view, the Netherlands present a very unusual spectacle. While the eastern elevated portion has a natural topography of its own, and consequently natural lines of drainage, the western lowlands are devoid of all drainage whatever, and every drop of rain water that falls, as well as all seepage water, must either evaporate or be pumped up and discharged through artificial means into the ocean, if accumulations and inundations are to be prevented.

Statistics show that in 1896, 2,519 square miles of polder land were being maintained with the aid of 444 steam-engines and 247 windmills; 1,234 square miles were being maintained with the aid of 1,706 windmills, or in all 2,397 pumping plants were required to drain 3,753 square miles.

What at one time were natural channels and water-courses have been since inclosed between dikes, and the level of their waters is now higher than that of the adjacent land. The large rivers that flow through these low districts are therefore here no longer rivers in the strict sense of the word, as the features and problems which they present are very distinct from those characteristic of natural streams. The smaller streams have in reality ceased to exist as such. For instance, the northern branch of the Rhine, along which general Drusus caused a levee to be built, is no longer a river; its waters no longer flow; it is



Forest Growth on the Dunes



The Dunes near Domburg, in the Province of Zeeland

nothing but an artificial channel, held between embankments and divided into a series of sections closed by means of locks. No longer does it empty its waters into the sea at Katwijk, where the light-house of Caligula once stood on an island in its estuary; but when the lock-tender at that point has orders to do so, some of its waters are allowed to escape at low tide when it is considered perfectly safe. The same condition is true of the smaller streams of the polder lands. Protected on the sea side by the dunes and dikes and partitioned off in the interior by an endless array of dikes which skirt the water-courses and canals, surround polders, and also serve as embankments to railroads and highways, Holland partakes much of the nature of a huge ship with water-tight compartments.

The immense amount of engineering which is required to keep up this com-

plicated system of dikes and waterways has always been a source of interest to technical men in other countries. No haphazard guesses are made as to the amount of water permissible in any particular waterway, nor as to the height or size of dikes required. Matters of this nature are determined with great nicety through the accumulations of past experience. As one waterway is frequently made to relieve another and the number of combinations must be varied as circumstances require, a knowledge of the fluctuations in the levels of all bodies of water becomes paramount. In order to supply this information, no less than 172 gage rods are maintained throughout the kingdom along the coasts, at estuaries, on large rivers, on canals, bosoms, and small streams, and a few even are located in foreign countries, as, for instance, the gage on the Rhine River at Cologne, Germany, which

has been maintained there by the Dutch Government since 1772. In order to derive the greatest possible use from the data so obtained, all the gage rods in the kingdom are referred to the same baselevel, mean high water, generally denoted by the symbol AP, and the heights of water thus indicated by them give directly the elevation of the water-levels with respect to that of mean high water of the sea.

The present kingdom has an area very nearly equal to the combined areas of the States of Connecticut and New Jersey.

Connecticut..... 4,990 square miles.
New Jersey..... 7,815 square miles.
Netherlands 12,738 square miles.

About 59 per cent of this area consists of alluvial formation, and is inclosed by dikes and provided with artificial drainage. There are, therefore, about 7,515 square miles of lowlands, very nearly equivalent to the area of the State of New Jersey, while the remaining highlands would cover an area about equal to that of the State of Connecticut. The discharge of the Rhine at the point where it enters the country is similar to that of the Tennessee River, while the flow of the Meuse may be compared with that of the Potomac.

SMALL AVERAGE RAINFALL, IN THE NETHERLANDS

As a large part of the Netherlands is drained artificially, a few words concerning the rainfall will be of interest. The country enjoys the unenviable reputation of possessing a wet soil and a still wetter atmosphere. Both of these attributes are popular exaggerations. The atmosphere of the Netherlands is frequently moist—that is, it contains at times a high relative humidity—but the rainfall nevertheless is moderate, not to say small. As compared with the United States, it will be found that the amount of precipitation that occurs annually in

the Netherlands is about the same as that of the Great Plains region. The normal precipitation for the Netherlands, as derived from observations extending over more than a century, is about 26 inches per annum, or only 5 inches more than half of the amount of rain that falls annually in Washington, D. C.; and, in spite of the reputed moist atmosphere of the Netherlands, the evaporation during the early summer months exceeds the precipitation.

*Table of Evaporation and Precipitation from Observations Made at Zwanenburg, near Amsterdam, During 1743-1843.**

Months.	Normal precipitation.	Normal evaporation.	Excess—	
			Precipita- tion.	Evapora- tion.
	<i>Inches.</i>	<i>Inches.</i>		
January.....	1.49	0.33	1.16	.....
February.....	1.46	0.57	0.89	.....
March.....	1.43	1.37	0.06	.....
April.....	1.49	2.39	.....	0.90
May.....	1.56	3.26	.....	1.70
June.....	2.09	3.74	.....	1.65
July.....	2.69	3.74	.....	1.05
August.....	2.97	3.25	.....	0.28
September.....	2.82	2.16	0.66	.....
October.....	3.09	1.24	1.85	.....
November.....	2.76	0.70	2.06	.....
December.....	2.03	0.53	1.50	.....
Total.....	25.88	23.28	8.18	5.58

In other words, there is a decided dry season, during which droughts are by no means uncommon. In order to keep the water in the ditches at the proper level, to prevent plant-growth from suffering during such droughts, an efficient remedy is found in allowing the water in surrounding bosoms and canals to run back into the polders, and the usual process of their maintenance is thus actually reversed.

The polder lands known as Rijnland,

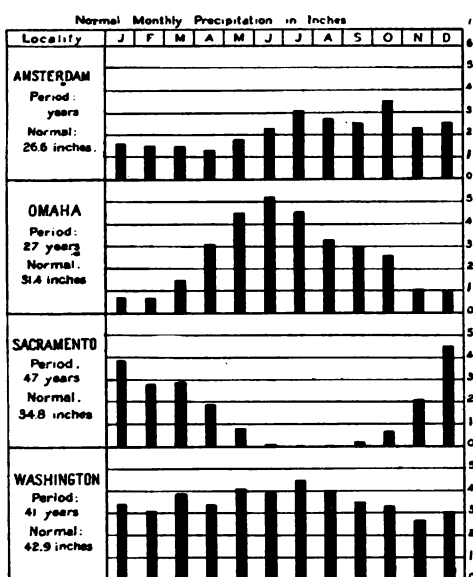
* From A. A. Beekman, *Nederland als Polderland*, p. 100.

an area of 417 square miles, it is estimated consume annually no less than 90 millions of cubic meters of water from adjacent rivers.

The climate of the Netherlands presents therefore an interesting anomaly. In spite of its small rainfall it does not exhibit any of the characteristic features of a semi-arid country, with the exception of some sandy, barren areas which are incapable of producing anything and are actually to be classed as desert

of the rainfall throughout the year. The lack of ample precipitation is thus more than offset by the humid condition of the soil, which makes aridity impossible.

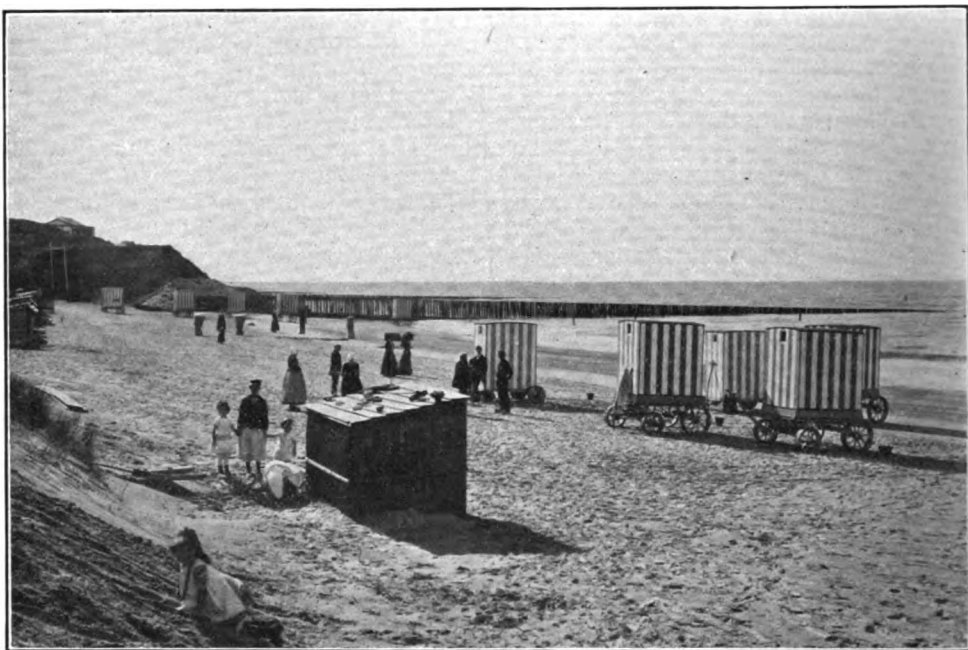
After reviewing all the difficulties and perils with which the Hollander has had to contend in the building up of his country, it at first sight appears strange that he should ever give up any portion of his valuable lands to the dangerous element that he has for centuries fought so desperately. But as in the course of the history of every nation it sometimes becomes necessary that the welfare of one or more individuals should be sacrificed for the good of the country or of the world at large, so there are times when the people of the Netherlands do not hesitate to cause large areas of land to be inundated in order to save what is dearer and more valuable. Recourse is had to such practice during the season of high waters on the rivers and also during times of war.



lands. Though an equal annual rainfall in the Great Plains region is not sufficient to produce forest growth, the Netherlands were practically entirely forest-clad at a period not so very remote, and probably would be so now but for the deforestation which has naturally attended its settlement. This anomaly is easily explained by three factors: the consistency of the Dutch soil, which renders it capable of absorbing and holding large quantities of water; the inexhaustible perennial streams and other bodies of water that feed it, and last, but not least, the even distribution

MEANS OF PROTECTION AGAINST FLOOD DISCHARGES

The rivers that flow through the Netherlands, like most streams of the northern hemisphere that flow in a northerly direction, are subject during the early spring months to ice jams and sudden flood discharges along their lower courses—a condition well nigh inevitable, as their waters flow from a warmer to a colder climate. In the Netherlands the Rhine, owing to the many channels into which it divides, can be controlled with far greater security than the Meuse, which, though a much smaller river, has a greater fall, and in its narrow, tortuous bed becomes when swollen a source of great danger, threatening to overtop its dikes. Sandbags and the many other devices employed so extensively in similar cases of emergency along the Mississippi levees are then used, but the most efficient relief

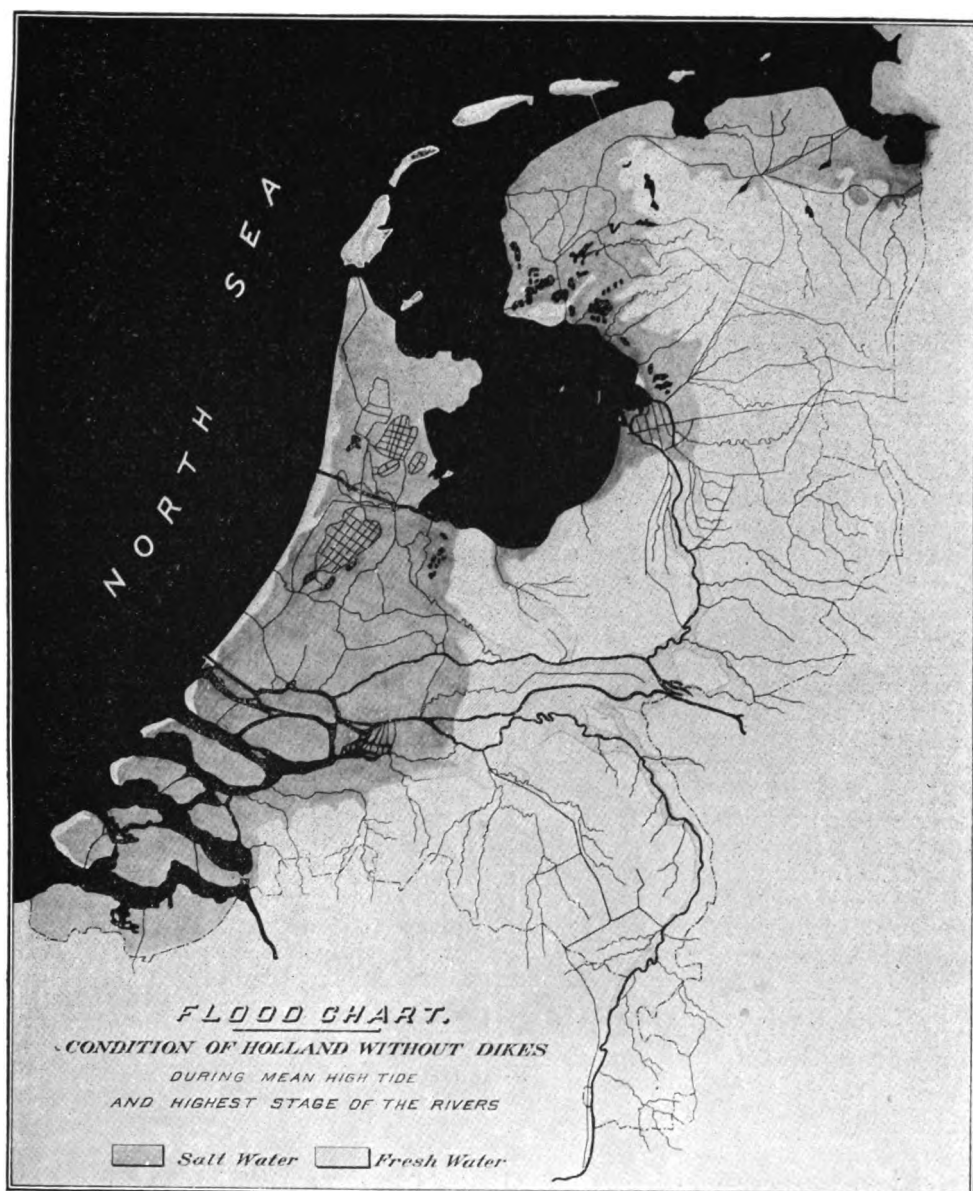


Pile Dikes for Protection against Marine Erosion

is afforded by allowing the swollen river to discharge a large part of its burden into the adjacent country. This is effected by providing at suitable points low dikes over which the water will run on reaching the danger line. These low dikes or weirs, known in Dutch as "overlaten," might well be compared to safety-valves. Their location is chosen in such a manner that the water discharged into the open country will do comparatively little harm, and, being confined by dikes especially designed for that purpose, is made to find its way to some low point farther down the river or near the latter's mouth.

Overlaten existed many years ago on all the large rivers, and although their use has saved the country much damage and expense, it has proved a serious evil in another way. It is obvious that whenever a river at the flood stage is

deprived at some point along its course of a large share of its burden the natural consequence is a lessening of the current below such a point and the depositing of a vast amount of sediment. Not only is this deposition of sediment at a time when the river transports a maximum amount a very serious evil, but the slackening of the current also offers most favorable conditions for the formation of ice jams. During the past years all the overlaten have been abolished with the exception of one on the Meuse, known as the Beerse Overlaat, which exceeds two miles in length and has been known to discharge with a head of three feet during severe floods, the river at such times being relieved of more than a third of its total flow. The policy at present is to increase the capacity of the river channels by deepening and widening the mouths, and in-



creasing their fall by regulating and dredging their beds. The amount of dredging annually by the government and by private parties reaches a very considerable figure. Nearly all of the sand and gravel used in dike-construction is obtained from the river bottoms by dredging.

THE DIKES A SYSTEM OF NATIONAL DEFENSE

In conclusion, a word should be said about the practice of inundating lands for defensive purposes. The efforts of the Dutch to flood their country, as described in Motley's *Rise and Fall of the Dutch Republic*, and later again in 1672, at the time of the war with France, are well known to those familiar with the history of the Netherlands. The methods employed in those days were not as successful as they might have been, and the blunders that were committed would have led to disastrous results but for the greater ignorance displayed by the attacking party. Thus, in 1672, the French army of invasion could not be prevented from draining some of the inundated lands, although their lack of knowledge of the complicated situation did not permit them to succeed at the time. When cold weather set in the manipulation of the water by the Dutch was so defective that large areas were allowed to freeze over, and the enemy was actually enabled to execute movements on the ice.

The enormous strength of defensive works of this class was, however, amply proved and the Government at the present day has provided an elaborate system

for flooding, which forms part of the military defenses of the lower provinces. Lands to be flooded are provided with special gage rods or bench-marks indicating the depth of water required in order to be effective. Special gates have been constructed in the dikes where water is to be turned onto the land, in order to avoid the slow and undesirable process of piercing dikes. The amount of water that is to be drawn for such purposes from bosoms and canals, the discharge that is to pass the gates in a given time, and the ultimate time required to flood a particular area to a certain depth are quantities that have been determined for each section of land with a nicety which no one can fail to appreciate who is familiar with hydraulic computations of the flow of water in open channels and through orifices.

There are at present about 1,000 miles of sea dikes in the Netherlands. The total length of dikes is difficult to estimate, and even if it could be estimated would mean but little, for it must be remembered that the dikes have for the most part in the course of time been destroyed and rebuilt repeatedly. It has not been so much a question of building them as it has been of maintaining them and keeping them where they were. Besides protecting the country from the invasions of both fresh and salt waters, the dikes have served to reclaim no less than 210,000 acres, nearly all of which are good, fertile land. It is to be hoped that the stupendous project of reclaiming the Zuider Zee will some day be carried into effect, whereby there would be added to the kingdom some half million acres of land.

MEXICO OF TODAY *

BY SENOR DR. DON JUAN N. NAVARRO, CONSUL-GENERAL OF
MEXICO IN NEW YORK CITY

THANKS to intelligence and honesty in the administration of our finances, the continual annual deficit that formerly afflicted Mexico, as it afflicts at present other nations, disappeared in the fiscal year 1894-'95, and in its stead we have since had a surplus. The surplus in that year was \$2,373,-434.42, and in the following year more than doubled, rising to \$5,451,347.29.

These results are the more surprising when it is remembered that a good part of our revenue is derived from import duties, and it might be supposed that the rapid development and progress of our industries would diminish that source of revenue.

The invoice value of our imports for 1896-'97 was \$42,204,095 in gold. Three years later, in 1899-1900, they had increased by nearly one-half, reaching \$61,318,175. The invoice value of our exports (in silver) amounted to \$86,-058,210 in 1892-'93, to \$104,741,443 in 1896-'97, and to \$142,615,070 in 1899-1900. The value of gold exported from Mexico in 1892-'93 was \$1,451,011, and during the next seven years increased many fold, reaching \$7,441,290 in 1899-1900.

At the end of the fiscal year 1898-'99 the federal treasury had a surplus in cash of \$27,535,602.62. Because of this prosperous condition of the treasury the taxes were reduced, and a part of the funds were applied to branches of public service:

For building primary schools in the federal district and for the corresponding departments.....	\$1,000,000
To finish the general hospital.....	500,000
For the building of the medical and geological institutes.....	200,000

For a new post-office in the capital and for the post-offices of Vera Cruz and Puebla.....	\$1,000,000
For a cable between the peninsula of California and the coast of Sonora.....	300,000
For the Navy Department.....	1,000,000
Total.....	\$4,000,000

To prove the financial credit of Mexico in the world, I will mention the conversion of our public debt from an interest rate of 6 per cent into another of 5 per cent. The contract for this operation, executed personally by our intelligent minister of finance, and involving a loan of 22,700,000 pounds, was signed in Berlin by different banking-houses from that city, London, New York, and the national bank of Mexico, on July 1, 1899. The conditions were as favorable as could be offered to any nation of well-established credit, and in the short time open for subscriptions the public of London, Amsterdam, New York, and Berlin subscribed for nearly twenty millions of pounds instead of for the 13,000,000 offered in the markets of those cities. The advantages for our treasury are not only the reduction of the disbursements for interest, a reduction amounting annually to more than \$1,800,000, but the reentry into the treasury of values mortgaged before as securities.

To give the last proof of the credit of Mexico, I will add that the bonds of the new loan began to be sold above par only a few months after they were issued.

The laws issued by the department on institutions of credit have produced good effects, and in November last we had 18 banks of emission, with a paid-up capital of \$52,900,000, and with notes in

* Concluded from the May number.

circulation to the value of \$65,897,100. Recently, on account of the war in China and the Philippine Islands, many millions of Mexican dollars have been exported, producing a certain stringency in the Mexican money market. The evil is not great, and it will disappear totally, owing to the opportune measures taken by the government and the prudent and conservative policy of the banks.

A few words now about our War and Navy Departments.

I admire the peace congresses, the anti-war speeches and sermons, but my opinion is that those well-intentioned persons lose their time, as there will always be war, because we cannot change the intimate nature of mankind, and universal and perpetual peace is a mathematical limit, to which mankind can approach but never touch, as then humanity would cease to be what it is.

The barbarism of war, the injustices and atrocities inseparable from it, are truths within the knowledge of every civilized man; but as long as there will be human passions, as long as there will be a great difference of strength among nations, there will be war. I think that there is a practical and efficient method, if not to extinguish what is an impossibility, at least to make international wars very rare, and that is to invent something equalizing as much as possible the strength of the different peoples, leveling to the greatest possible extent the weak with the strong. The invention of dynamite and other explosives, the great improvements in hand arms and in the artillery, under equality of circumstances favor more the defense than the attack, and are therefore in favor of the weak, and are producing in favor of peace and justice an excellent and practical effect. I say justice, because in the majority of cases justice is on the weak side.

An army is a necessity. Justice is represented by the image of a girl hav-

ing a balance in her left hand and a sword in the right, and unfortunately, but truly, she is obliged to use the sword more than the balance.

Armies at the beginning and the middle of the last century were in many cases bodies of men with interests and exigencies opposite to those of the nation's supporting them.

In our times good armies must be bodies of armed men, taught not only military exercises, but to know that the law is superior to everything; that they form a part of the nation of whom they are servants and not masters. Every citizen must be a soldier, because every citizen has the ineludible duty of keeping peace and order in the interior and repelling the foreign invader. That, it seems to me, is the only way of forming and keeping an army, especially in a country ruled by republican institutions.

In Mexico experience has conclusively shown that officers and even soldiers cannot be improvised, and the very first care of General Diaz has been to establish a good school for instructing scientific officers. The military school of Chapultepec in its actual condition is the fruit of his efforts. Many foreign officers of different nationalities have visited that establishment and believe that it ranks among the first in the comprehensiveness and perfection of military instruction there imparted and in the severe but just discipline to which the cadets are subjected.

From that institution are graduated all the officers of our army, and new rules have been recently issued to prevent the abuse committed by some persons who go there to receive a good and gratuitous education without any intention of serving in the national army.

In the capital and in many other places commodious barracks, affording comfort and good hygienic conditions to the soldiers, have been constructed or are in the course of construction. The soldiers are armed with weapons

pronounced to be the best by technical commissions after long, conscientious, and severe trials, and our artillery includes some pieces of a system invented by one of its best officers, Colonel Mondragon.

The cavalry is composed of excellent riders, very easy to find in Mexico, and provided with horses selected expressly for military service.

The barracks are not as before—places for keeping the soldiers—but schools where reading, writing, and elementary arithmetic and different trades are taught. The troops are subject to the strictest discipline, but at the same time the inferior has always within his reach the means to redress an injustice or to prevent or have punished an ill-treatment from his superior. The military code has been one of the works to which the government has particularly directed its attention, to put it in perfect harmony with justice and the republican institutions ruling the country. The ambulance and hospital branch receives continual additions to its equipment, and is formed from many of the best surgeons and physicians. Experience has proved its efficiency. There are officers selected by the government studying in foreign countries, and their observations are applied to the improvement of our army.

Very recently the government has issued a decree for the reorganization of the army, with the object of keeping in active service the same number of troops we have now, but of supplying the means to increase that force to the extent of some hundreds of thousands in time of necessity, and adding as a reserve the whole nation in the case of a foreign invasion.

Our navy is in its infancy, but the flotilla we have around Yucatan to provision the land troops and to cooperate with them and to subdue those of the Maya Indians who refuse to obey the laws regulating a civilized community

is rendering invaluable services. Little by little the number and size of our war vessels will be increased, as our government never loses sight of that important branch of national defense.

To conclude, Mexico is a country endowed with many natural gifts, ruled by a wise government and republican institutions equal to the United States in essential points, inhabited by 14,000,000 intelligent, peaceful, and industrious people, remarkable for their natural courtesy and hospitality, which is extended to all without distinction of nationality.

Mexico cultivates friendly relations with the whole civilized world, and is in the most intimate intercourse with the Government and people of the United States.

The governors of the States, into which the Republic is divided, cooperate intelligently with the federal authorities to establish and maintain all moral and material improvements.

There is a complete and constantly improving system of public education, uniform in the country, which is making education compulsory and gratuitous, and the schools, nearly 13,000, are attended by numerous pupils, and the extension of elementary knowledge to the lowest classes of our people is the best proof of the methods employed.

Industry in all its branches is growing at a wonderful pace, and the number of manufactories is in constant progress and their products are of a high grade.

The means of communication are numerous, there being in actual operation more than 9,000 miles of excellent railroads, and more than 61,000 miles of telegraphic and telephonic lines, and different submarine cables for communication with every civilized nation.

The national and international postal system is now very good and growing continually to a degree of great perfection.

The national treasury is in a flourishing condition, and we Mexicans can say

with pride that it is administered with consummate ability and perfect honesty.

Finally, we are in perfect peace, and there is not a single cloud on our political horizon, and therefore it is the time to form upon solid foundations our army and military institutions, following the old Roman maxim, as true today as in the times of Cæsar, "In time of peace prepare for war."

The Mexican people have fought for their independence against great odds, with poor arms, without a cent, and having scarcely the necessary food to maintain life, and have fought incessantly till they have come out victorious. That same people, well armed, with abundant pecuniary resources, and guided by good

scientific officers, are preparing for their future and unknown invaders some little surprises probably beyond the expectation of the attacking party.

I have lived in your powerful and interesting country for more than thirty-seven years, receiving uninterrupted proofs from the authorities and people of esteem and consideration, and I avail myself of this occasion to make manifest my heartfelt thanks for so much kindness.

May your Republic be always prosperous, guided by the sublime maxims of its immortal and virtuous founder, who condensed all his wise advice to his people in those five words of eternal truth, "Justice is the best policy."

SIR JOHN MURRAY

SIR JOHN MURRAY has recently returned from a six months' expedition to Christmas Island, a tiny isle 200 miles south of Java, and has thus added one more to his many interesting explorations. Sir John was born in Coburg, Ontario, Canada, on March 3, 1841. He received his early education at a public school in London, Ontario, and at the Victoria College, Coburg, Ontario; but when a youth he removed to Scotland, where his education was continued at the High School of Stirling and at the University of Edinburgh.

In 1868 he took a voyage in an Arctic whaler to Spitzbergen and other places in the Arctic regions. In 1872 he was appointed as naturalist on the civilian scientific staff of the *Challenger* Expedition, and in that capacity accompanied H. M. S. *Challenger* during her scientific circumnavigating cruise from 1872 to 1876. On the return of the expedition he became first assistant, under Sir C. Wyville Thomson, on the commission

appointed to prepare the scientific results for publication, and in 1882, owing to the failing health of Sir C. Wyville Thomson, he was appointed editor of the "Challenger Reports." These "Official Reports on the Scientific Results of the Voyage of H. M. S. *Challenger*" filled fifty large royal quarto volumes, and were published at intervals as ready, the first volume appearing in 1880 and the final volumes in 1895. Besides editing nearly the whole series, Sir John Murray was joint-author of the "Narrative of the Cruise" and of the "Report on the Deep-Sea Deposits," and author of a "Summary of the Scientific Results," in two volumes. The British Government has presented copies of these reports to scientific institutions and learned societies in all quarters of the globe.

In addition to superintending the work of publishing the "Challenger Reports," he has during the past thirty years published a large number of papers on oceanographical, geographical, geological, and other subjects,



Sir John Murray

many of them of great interest and scientific value, in which he has expressed some novel and ingenious ideas respecting the past and present condition of our planet.

In 1880 Sir John Murray took part in a scientific exploration of the Faroe Channel, between the north coast of Scotland and the Faroe Islands, in H. M. S. *Knight Errant*, and again in 1882, in the same region, in H. M. S. *Triton*. He was for several years scientific member of the Fishery Board for Scotland, and in 1899 he was appointed a delegate of the British Government at the International Fisheries Conference at Stockholm. He also acted as president of the Geographical Section of the British Association for the Advancement of Science, Dover, 1899.

During eight or ten years he was engaged in a bathymetrical and biological survey of the coast of Scotland in his small steam yacht, the *Medusa*, in which work he was assisted by many scientists. He has also taken an active part in the foundation of marine stations for physical and biological research at

Granton, near Edinburgh, and at Millport, on the island of Cumbrae, in the Firth of Clyde, as well as in the foundation of the meteorological observatories on the summit and at the foot of Ben Nevis, the highest mountain in Scotland.

Christmas Island was added by England to the colony of the Straits Settlements in 1889, and is some 12 miles long by seven broad. It has rich phosphate deposits, which are worked by an English company. The works give employment to about 700 coolies and a score of whites, but is believed never to have been inhabited prior to the English annexation.

In recognition of his scientific work Sir John Murray has been awarded the Cuvier prize of the Institute de France, the Humboldt medal of the Gesellschaft für Erdkunde zu Berlin, the Royal medal of the Royal Society, the Founder's medal of the Royal Geographical Society, the Keith and the Makdougall-Brisbane medals of the Royal Society of Edinburgh and the Cullum medal of the National Geographic Society of Washington.

GEOGRAPHIC NOTES

POPULATION OF UNITED KINGDOM

FORTY-ONE and one-half millions of people are now crowded into the United Kingdom. A similar density of population in the United States would mean a total population in this country, excluding the dependencies, of about 1,036,000,000.

For the last ten years England and Wales show a rate of increase of 12.15 per cent, which slightly exceeds their rate of growth for the preceding decade, 11.65 per cent; Scotland, a rate of increase of 10.8 per cent, also a greater increase than during the preceding decade, and Ireland a rate of decrease of

only 5.3 per cent, which is little more than one-half the rate of decrease of the preceding decade. The census figures are thus very gratifying to Englishmen, for they show no signs of diminishing national vitality, but rather tend to show increasing national virility. It is yet too soon to give exact percentages of the relative growth of the urban and rural districts, but what figures have been given show a most marked increase in city populations.

The population of England and Wales is now 32,525,816, of Ireland 4,456,546, and of Scotland 4,471,957, making a total population for the United Kingdom of 41,454,219.

POPULATION OF AUSTRALIA AND
NEW ZEALAND

THE recent census of Australia, according to cabled reports, shows that the population of this great confederation has increased about 16.9 per cent in the last ten years, or 514,000 in round numbers, which exceeds the rate of growth of England, but falls much behind that of the United States. The present population of the island continent is 4,550,651 as against 4,036,570 in 1891. Apparently the Australians are spreading out more, for all the cities except Sydney show a less comparative increase than the country districts. Melbourne, for instance, since 1891 has added only 3,000 to her inhabitants and now numbers 493,956. Sydney ten years ago had a population of about 385,000, but the city has grown very rapidly and now is only a few thousand behind Melbourne. Victoria has given way to New South Wales as the most populous colony, though the former is still the most densely populated. Victoria has a present population of about 1,196,000, and New South Wales of 1,362,232.

New Zealand has added 146,000 white persons to her population, so that today there are 773,000 white people within her borders. Her rate of growth for the preceding decade is thus 23 per cent, which would tend to show that her radical social laws attract immigrants, notwithstanding the very high *per capita* debt of the government. Including the Maori, the population of New Zealand is 816,000.

THE CENTER OF POPULATION OF
THE UNITED STATES

A POINT in the interior of the earth 600 miles beneath the city of Nashville, Tenn., has been computed by Mr. Henry Gannett as approximately the center of population of the United States and its dependencies, including

Alaska, Cuba, Porto Rico, and the Philippines. In other words, the center is beneath the intersection of the 36th parallel with the 87th meridian.

In computing this center of population it is necessary to regard the earth as a sphere rather than a plane surface, for Porto Rico and the Philippines are nearly half the earth's circumference apart.

But if Alaska and the recent territorial acquisitions be disregarded, the center of population of the United States is six miles southeast of Columbus, in Bartholomew County, Indiana. In the ten years preceding June 1, 1900, the center of population has thus moved westward 14 miles and southward two and one-half miles, the smallest movement ever noted by the Census Bureau.

It shows the population of the Western States has not increased as rapidly as in former decades. The southward movement is due largely to the great increase in the population of Indian Territory, Oklahoma, and Texas, and the decreased westward movement to the large increase in the population of the North Atlantic States.

The center of area of the United States, excluding Alaska and Hawaii and other recent accessions, is in northern Kansas. The center of population, therefore, is about three-fourths of a degree south and more than 13 degrees east of the center of area.

SERVIA

THE little kingdom of Servia, the actions of whose monarch and his consort have aroused so much comment during the past year, is about the size of the States of New Hampshire and Vermont combined. Surrounded on all sides by foes or unreliable friends—Bulgaria on the east, Turkey on the south, Roumania and Austro-Hungary on the north and west—its life since it became a semi-independent nation has been a

hard one, especially as it has not known how to protect itself against attacks which its own deceitful arrogance has aroused.

The country is mountainous and hilly, without any of the mountains, however, attaining great height. Mt. Midzur, on the eastern boundary, with a height of 7,106 feet, overtops all others in the kingdom. The mountains of Servia are the ramifications of four systems which invade the kingdom from different directions. One branch comes from the east from Bulgaria, a second from the southeast from Macedonia, a third from the south from Albania, and the fourth from the west from Montenegro. Rivers, streams, and rivulets, all flowing in different directions, still further subdivide the country, but between the mountains and along the large rivers are rich and fertile sloping valleys and plains. Two and one-quarter millions of people cultivate all the available land. Servia is distinctly an agricultural country; 83.6 per cent of her people till the soil, and about 85 per cent in value of her exports are cattle and agricultural products.

The climate is temperate and dependent on the winds, which, on the whole, are constant from the northwest and northeast during the winter and from the west and southwest during summer. A temperature of about 25.2° Fahr. during winter and 69.98° during summer is the normal.

Twenty-five years ago, in 1876, Servia was clothed with forests, and was aptly termed "the land of the forest;" but the Servian-Turco trouble of 1876-'78 played havoc with the forests. Thousands of acres were stripped of trees in order to serve for fortifications or to bar the advance of the Turkish army or to warm the great masses of troops that camped on the land during two winters. The war was followed by a period of ruthless destruction of the forests, vast tracts being sold at a ridiculous price or denuded to supply the railroads.

GEOGRAPHIC NAMES

THE following decisions were made by the U. S. Board on Geographic names May 1, 1901:

- Goose; point, Chincoteague Bay, Worcester County, Maryland (not Clam).
- Hardship; branch of Pocomoke River, Worcester County, Maryland (not Hardshift).
- Long; point, Chincoteague Bay, Accomac County, Virginia (not Bodkin).
- Nofat; mountain between Buncombe and Madison counties, North Carolina (not No Fat nor No-fat).
- Ricks; point, Chincoteague Bay, Worcester County, Maryland (not Rich, Rich's, nor Rick's).
- Robin; creek and marsh, Chincoteague Bay, Worcester County, Maryland (not Robbins, Robins, nor Robin's).
- Rockawalking; creek, post-office, and railroad station, Wicomico County, Maryland (not Rock-a-walkin).
- Scarboro; creek and railroad station, Worcester County, Maryland (not Scarborough's).
- Seeley; creek, Sauk County, Wisconsin (not Seely).
- * Smoke; creek, south of Buffalo, Erie County, New York (not Smokes).
- Taylorville; village, Worcester County, Maryland (not Taylor nor Taylorsville).
- Tilhance; creek, Berkeley County, West Virginia (not Tilahanchee, Tilchancos, Tilehance, Tillehances, etc.).
- Whittington; point, Chincoteague Bay, Worcester County, Maryland (not Willington's).

PREHISTORIC SURGERY

AN item going the rounds of the press relates to the Mufiz collection of trephined crania from Peru, exhibited at the Pan-American Exposition by W J

* Erroneously given in May number of this Magazine, p. 201, as in Pennsylvania.

McGee. The collection comprises 19 crania, of which several were trephined more than once. The trephined skulls were selected from a collection of 1,000 made by the late Dr. Manuel A. Muñiz in pre-Columbian, and probably pre-Incan, cemeteries in different portions of Peru; and they are of interest as showing that this major surgical operation was more common among the aborigines of South America than in the most highly advanced nations of today.

The ratio of trephined crania is just below two per cent; but since one specimen shows three operations and two others three each, the ratio of trephining to population indicated by the collection is nearly two and one-half per cent. The technic of the operation was critically studied by McGee, and described in a recent report of the Bureau of American Ethnology. It would appear from his researches that the operation was not therapeutic in the ordinary sense of the term, but was thaumaturgic and closely allied to the so-called "medicine" of various tribes, in which the treatment consists of occult ceremonies and skillful jugglery by the shamans.

UNEXPLORED CANADA

ONE-THIRD of the area of Canada is practically unknown, states the Director of the Geological Survey of the Dominion in his last report.

There are more than 1,250,000 square miles of unexplored lands in Canada. The entire area of the Dominion is computed at 3,450,257 square miles; consequently one-third of this country has yet been untraveled by the explorer. Exclusive of the inhospitable detached Arctic portions, 954,000 square miles is for all practical purposes entirely unknown.

Most of this unknown area is distributed in the western half of the Dominion

in impenetrated blocks of from 25,000 to 100,000 square miles—that is, areas as large as the States of Ohio, Kansas, or New England are yet a secret to white man.

Beginning at the extreme northwest of the Dominion, the first of these areas is between the eastern boundary of Alaska, the Porcupine River, and the Arctic coast, about 9,500 square miles in extent, or somewhat smaller than Belgium, and lying entirely within the Arctic Circle. The next is west of the Lewes and Yukon Rivers and extends to the boundary of Alaska. Until last year 32,000 square miles in this area were unexplored, but a part has since been traveled. A third area of 27,000 square miles—nearly twice as large as Scotland—lies between the Lewes, Pelly, and Stikine Rivers. Between the Pelly and Mackenzie Rivers is another large tract of 100,000 square miles, or about double the size of England. It includes nearly 600 miles of the main Rocky Mountain range. An unexplored area of 50,000 square miles is found between Great Bear Lake and the Arctic coast, being nearly all to the north of the Arctic Circle.

Nearly as large as Portugal is another tract between Great Bear Lake, the Mackenzie River, and the western part of Great Slave Lake, in all 35,000 square miles. Lying between Stikine and Laird Rivers to the north and the Skeena and Peace Rivers to the south is an area of 81,000 square miles, which, except for a recent visit by a field party, is quite unexplored. Of the 35,000 square miles southeast of Athabasca Lake, little is known, except that it has been crossed by a field party en route to Fort Churchill. East of the Coppermine River and west of Bathurst Inlet lies 7,500 miles of unexplored land, which may be compared to half the size of Switzerland. Eastward from this, lying between the Arctic coast and Blacks River, is an area of 31,000 square miles, or about

equal to Ireland. Much larger than Great Britain and Ireland, and embracing 178,000 square miles, is the region bounded by Blacks River, Great Slave Lake, Athabasca Lake, Hatchet and Reindeer Lakes, Churchill River, and the west coast of Hudson Bay. This country includes the barren grounds of the continent. Mr. J. B. Tyrell recently struck through this country on his trip to Fort Churchill, on the Churchill River, but could only make a preliminary exploration. On the south coast of Hudson Bay, between the Severn and Attawapishkat Rivers, is an area 22,000 square miles in extent, or larger than Nova Scotia, and lying between Trout Lake, Lac Seul, and the Albany River is another 15,000 square miles of unexplored land. South and east of James Bay and nearer to large centers of population than any other unexplored region is a tract of 35,000 square miles, which may be compared in size to Portugal.

The most easterly area is the greatest of all. It comprises almost the entire interior of the Labrador Peninsula or Northwest Territory, in all 289,000 square miles, or more than twice as much as Great Britain and Ireland. Two or three years ago Mr. A. P. Lowe made a line of exploration and survey into the interior of this vast region, and the same gentleman also traveled inland up the Hamilton River, but with these exceptions the country may be regarded as practically unexplored.

The Arctic islands will add an area of several hundred thousand square miles of unexplored land.

The government during the past year has made a great effort in the direction of exploring and developing this vast territory. It has recognized the fact that railroads are essential to the development of a new country, and liberal inducements for their construction are made by granting millions of acres of land as a bonus.

GEOGRAPHIC PROGRESS IN SOUTH AMERICA

THE governments of the South American Republics are beginning to make an effort to obtain a better knowledge of their vast territories. One hundred years ago South America, next to Europe, was the most accurately known of the continents. Today it is the least known of them all, so rapid has been geographic progress elsewhere and so tardy in South America.

The government of Bolivia has recently taken steps to obtain a complete survey of the country. A Paris firm has engaged to immediately survey and map 40,000 square kilometers and to lay off a triangulation which will enable a complete trigonometrical survey of the country to be made. Bolivia has also arranged with Paraguay for a joint commission to trace and mark the boundary between the two nations. A joint commission with Brazil several months ago commenced surveying the Bolivian-Brazilian line. A school of mines has also been established by the Bolivian Government to train and encourage its own people to the development of its mineral resources.

COMMERCIAL RELATIONS OF THE UNITED STATES

THE Bureau of Foreign Commerce of the Department of State has issued its report on the commercial relations of the United States for 1900. The introduction, by the chief of the Bureau, Frederic Emory, contains several pertinent pages on the present ascendancy of the United States:

"Lord Rosebery is quoted by cable as having said in a speech before a British chamber of commerce January 16, 1901, that the chief rivals to be feared by Great Britain 'are America and Germany. The alertness of the Americans,' he continued, 'their incalculable natural

resources, their acuteness, their enterprise, their vast population, which will in all probability within the next twenty years reach 100,000,000, make them very formidable competitors with ourselves. And with the Germans, their slow, but sure, persistency, their scientific methods, and their conquering spirit, devoted as these qualities are at this moment to preparation for trade warfare, make them also, in my judgment, little less redoubtable than the Americans. There is one feature of the American competition which seems to me especially formidable, and as I have not seen it largely noticed, perhaps you will excuse me for calling attention to it. We are daily reminded of the gigantic fortunes which are accumulated in America, fortunes to which nothing in this country bears any relation whatever, and which in themselves constitute an enormous commercial force. The Americans, as it appears, are scarcely satisfied with these individual fortunes, but use them, by combination in trusts, to make a capital and a power which, wielded as it is by one or two minds, is almost irresistible, and that, as it seems to me, if concentrated upon Great Britain as an engine in the trade warfare is a danger which we cannot afford to disregard. Suppose a trust of many millions, of a few men combined so to compete with any trade in this country by underselling all its products, even at a considerable loss to themselves, and we can see in that what are the possibilities of the commercial outcome of the immediate future.'

"It has been evident for some time that the United States, not content with having solved that part of the problem of economy of production which relates to processes of manufacture and the utilization of labor, has been drifting instinctively toward the larger question of the concentration of capital as the logical development of the same general idea of reducing cost and increasing the margin

of profit. The question is larger because it has a more direct and more general bearing upon the economic and social life of the nation; upon the interests, real or imagined, of the whole body politic. We have to do with it here only because of its relation to and possible effect upon our foreign trade, and it is interesting to know that so thoughtful an observer as Lord Rosebery perceives in the simplification of the use of capital in the United States which is going on—it may be said experimentally, to a large extent, as yet—a tremendous power in the commercial rivalry of the world.

"Germany, as well as Great Britain, seems fully sensible of the seriousness of American competition. In a recent issue the *Hamburger Fremdenblatt* points out that the United States, which ten years ago exported more than 80 per cent of agricultural products and less than a fifth of manufactured goods, today draws nearly a third of its entire export from the products of its factories. 'In other words, the Union is marching with gigantic strides toward conversion from an agricultural to an industrial nation.' Does not the rapid increase of the United States in the value of industrial exports, the *Fremdenblatt* asks, 'constitute an imminent danger for all competing nations?'

"The *Fremdenblatt's* conclusion is that Europe 'must fight Americanism with its own methods; the battle must be fought with their weapons, and wherever possible their weapons must be bettered and improved by us; or, to speak with other and more practical words, Germany—Europe—must adopt improved and progressive methods in every department of industry, must use more and more effective machinery. Manufacturers as well as merchants must go to America, send thither their assistants and workmen, not merely to superficially observe the methods there employed, but to study them thor-

oughly, to adopt them, and, wherever possible, to improve upon them, just as the Americans have done and are still doing in Europe."

The following table shows the imports and exports for 1900 of all countries for which statistics have been received by the Bureau of Foreign Commerce:

	Imports.	Exports.
United States	\$829,052,000	\$1,478,050,000
United Kingdom	2,518,260,000	1,725,422,000
Germany	1,388,328,200	1,084,159,200
France (11 months)	773,058,600	719,686,600
Belgium	409,139,500	346,808,100
Austria-Hungary (9 mos.) ..	280,887,200	317,954,200
Spain (11 months)	123,181,100	101,868,500
Servia (9 months)	7,687,000	8,778,900
Russia (8 months)	119,110,200	210,807,000
Switzerland	214,800,000	164,000,000
Italy (11 months)	275,792,300	237,367,100
Greece (3 months)	5,690,700	3,894,900
Mexico (1896-1900)	61,304,900	71,396,600
Canada (1899-1900)	182,951,400	175,656,900
British India (1899-1900) ..	293,345,200	374,163,900
British Guiana (1899-1900) ..	6,329,800	9,254,200
Cuba (1899-1900)	71,681,200	45,228,300
Philippines (1899-1900) ..	20,597,100	19,751,100
Porto Rico (10 months ended April, 1900)	8,730,600	4,594,400
Japan (10 months)	124,261,200	81,146,800
Egypt (10 months)	54,029,100	60,350,900
French Guiana (6 months) ..	1,648,800	1,388,300

U. S. GEOLOGICAL SURVEY

THE U. S. Geological Survey has assigned the following field parties for work during this season:

Arizona: T. A. Jaggar, Waldemar Lindgren, J. M. Boutwell, F. L. Ransome, John D. Irving, and R. T. Hill.

Arkansas: George I. Adams.

California: George F. Becker, W. Lindgren, J. C. Branner, J. S. Diller, Geo. H. Eldridge, and H. W. Turner.

Colorado: C. W. Cross, Ernest Howe, J. Morgan Clements, S. F. Emmons, John D. Irving, and George I. Adams.

Connecticut: William H. Hobbs and H. E. Gregory.

Delaware: R. D. Salisbury and George B. Shattuck.

Georgia: Arthur Keith.

Idaho: Bailey Willis.

Indiana: George H. Ashley.

Indian Territory: J. A. Taff and George I. Adams.

Kansas: W. S. Tangier-Smith.

Kentucky: M. R. Campbell and George H. Ashley.

Louisiana: George I. Adams.

Maryland: Continuation of coöperative work as in previous years; William B. Clark, E. B. Matthews, and George B. Shattuck; study of ancient crystalline rocks, paleozoic stratigraphy, and coastal plain deposits.

Massachusetts: B. K. Emerson.

Michigan: Frank Leverett, F. B. Taylor, C. R. Van Hise, C. K. Leith, and W. S. Bayley.

Minnesota: C. R. Van Hise and J. Morgan Clements.

Missouri: W. S. Tangier-Smith.

Montana: Continuation of special studies in the Rocky Mountains; Charles D. Walcott, director; W. E. Weed, and Bailey Willis.

Nevada: G. K. Gilbert.

New Jersey: R. D. Salisbury and George B. Shattuck.

New Mexico: George H. Girty, R. T. Hill, and C. W. Cross.

New York: L. C. Glenn, T. N. Dale, and J. F. Kemp.

North Carolina: Arthur Keith.

North Dakota: N. H. Darton and C. M. Hall.

Ohio: Charles S. Prosser.

Oklahoma: J. A. Taff.

Oregon: J. S. Diller.

Pennsylvania: Parts of Butler, Armstrong, Indiana, Washington, Westmoreland, Fayette, and Tioga Counties, M. R. Campbell, A. C. Spencer, George B. Richardson, and L. Fuller; northern Pennsylvania, George H. Girty; Philadelphia and vicinity, Prof. Florence Bascom and C. R. Van Hise; refractory clays of Pennsylvania, C. W. Hayes; Fulton and Franklin counties, George W. Stone; coal measures, C. D. White.

South Carolina: Arthur Keith.

South Dakota: N. H. Darton and J. E. Todd.

Tennessee: Arthur Keith.

Texas: R. T. Hill and George I. Adams.

Utah: G. K. Gilbert.

Vermont: T. N. Dale and J. E. Wolff.

Washington: F. L. Ransome and Geo. Otis Smith.

West Virginia: Coöperation with State survey under Prof. I. C. White; Wayne county, M. R. Campbell, survey of Ceredo quadrangle.

Wisconsin: C. R. Van Hise and W. C. Alden.

Wyoming: W. C. Knight, N. H. Darton, George I. Adams, and Arnold Hague.

Dr. Gregory, who was to have had charge of the scientific work of the British South Polar Expedition, has resigned his connection with the expedition. Friction between the naval and scientific staffs is believed to be the cause of his withdrawal.

Gen. A. W. Greely, Chief Signal Officer U. S. Army, will make a general inspection of the signal service in the Philippine Islands during the present season. The larger islands of the archipelago are now connected by cable, and each has a telegraph system which includes most of the larger towns.

The U. S. Biological Survey will this summer continue the study of the geographic distribution of animals and plants in Texas. The Survey has been engaged in the work for several years, and in due time will issue maps showing the life zones and faunal areas in the State. Mr. Vernon Bailey has charge of the work and has already begun field operations in southwestern Texas.

Exploration of the Sea.—A meeting of representatives of all the countries bordering on the Baltic and North Seas, excepting France, was recently held in Christiania to confer on the programme for the exploration of the seas between Greenland, Iceland, and Norway. Each

of these nations will have a special section assigned to it for study, so that a complete knowledge of the currents, sea bottoms, etc., may be soon obtained. The Norwegians and Russians have already equipped special steamers to carry out their share of the work, and work on the German vessel which is building for the same purpose is well advanced.

The Bureau of American Republics has published two handsome maps of Mexico on the scale of 50 miles to the inch. The first map, besides being a general map of the country, by colors shows the elevation of every part of the Republic. It also gives the agricultural features, showing what sections are wheat-growing, what are favorable to the great Mexican staple henequen, etc. The second map shows the distribution of minerals throughout the country as far as prospecting has revealed their location. These maps are the result of much research, combining all the results of latest surveys. The Bureau announces that similar maps of all the Central and South American Republics are in course of preparation. The map of Brazil is nearly completed, and work on the maps of Guatemala and Costa Rica well advanced.

The Royal Geographical Society has this year awarded the Founders' medal to the Duke of Abruzzi for his two feats of being the first to ascend Mt. St. Elias and of gaining what is now "farthest north," 86° 33'. The expense of each of these expeditions was borne mainly by the Duke, though his uncle, the late King Humbert, generously aided him. The Society has awarded the Patrons' medal to Dr. A. Donaldson Smith for his explorations in Central East Africa in 1894-'95 and 1898-1900. Dr. Smith traversed the last densely inhabited area remaining unexplored in Africa—the country between Lake Rudolf and the White Nile. Awards have

also been made by the Society to Captain Cagni, of the Duke of Abruzzi's party, and to Mr. L. Bernacchi and Captain Colbeck for aid in Borchgrevink's South Polar Expedition. King Edward VII has succeeded Queen Victoria as Patron of the Society.

Philippine Weather Service.—The Philippine weather service has now scattered throughout the archipelago some 20 telegraphic stations from which advance warnings of the approach of typhoons can be wired to Manila. Before the revolution of 1897 Spain had a number of similar stations located at strategic points, but when Dewey entered Manila Bay not one remained outside of the city. After the occupation of the islands by the American Government plans were at

once formed by the Chief of the U. S. Weather Bureau, aided by Father Joseph Algué, S. J., to reorganize and extend the former service, and now that the pacification of the islands is nearly secured, these plans are rapidly becoming realized. The Philippine service is in charge of the Manila Observatory, with Father Algué as director. It is supported by the funds of the Philippine Government rather than those of the United States, and is independent of the U. S. Weather Bureau, but receives the active coöperation and assistance of the latter. As soon as enough of the islands have been connected by cables the U. S. Government will organize an extensive system, and the Philippine service will be incorporated under Federal direction.

GEOGRAPHIC LITERATURE

Report of the Chief of the Weather Bureau, 1899-1900. U. S. Department of Agriculture. Pp. 436. 1901.

Prof. Willis L. Moore gives a comprehensive statement of one year's work of this great scientific branch of the Government. During the year many important advances were made. A station established at Turks Island completed the chain of stations extending from the Lesser Antilles northwestward to Bermuda and the southeastern coast of the United States. Plans were formed, and have since been realized, for special storm forecasts for the North Atlantic Ocean, giving the wind force and wind direction for the first three days of the route of all outgoing steamers. Experiments were made in wireless telegraphy, and eminently satisfactory progress made in the investigation. A reduction to a homogeneous system of the barometric observations taken by the service during the past 30 years was un-

dertaken. The total eclipse of May 28, 1900, was observed by Professors Bigelow and Abbe, at Newberry, S. C., and new information (to be published later) obtained regarding the effect of solar action upon the earth's atmosphere. Arrangements for distributing forecasts and warnings to vessels navigating the Great Lakes were so perfected that each of the 20,000 vessels that passed Detroit received the latest weather news, and also vessels leaving Chicago and the Great Lake ports. Forecasts of cold waves, of hurricanes, and of floods saved millions of property.

A valuable feature of the report are tables, prepared by Prof. A. J. Henry, giving the monthly mean, maximum, and minimum temperature, pressure, and moisture of 170 Weather Bureau stations. The meteorological observations of Evelyn B. Baldwin during the Wellman Arctic Expedition of 1898-'99 complete the report.

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quest was to bring the domain under a single master, either an individual or a nation, so that throughout the wide extent only one authority should be acknowledged. This was to be a conquest by force over the barbarians and scattered tribes which constituted its only inhabitants. It was possible whenever sufficient force from outside should be employed. The second conquest was that over inhospitable and hostile nature, over distance and climatic conditions. It was to introduce a national element and make a cold and repellent region pulsate with the warmth and energy of national impulse and life. It was to conquer the wilderness by civilization, but a wilderness which the civilization of even the recent past would have been unable to subdue. Through the centuries for this second conquest the land had been waiting. Civilization has been well defined as the victory of mind over external obstacles. Not till the close of the nineteenth century had science furnished civilization the arms for the subjugation of Siberia.

THE FIRST CONQUEST

It is of interest and significance to us Americans when recalling our colonial history to observe how while one wave pressed outward across the Atlantic another wave pressed eastward into Asia. The stream of European conquest which reached the American shores from western Europe was paralleled in Siberia by a contemporaneous stream of conquest from eastern Europe.

In 1558 the English Elizabeth began her memorable reign. That same year Ivan the Awful gave Gregori Strogonoff twenty square miles of desert land upon the River Kama, with permission to attack anything toward the east. "The Good Companies of the Don," a euphemistic name for the mob of brigands and outlaws, furnished an army. Irmak Timofeeff, the more than Pizarro or

Cortez of the Slavs, became chief commander of their wild forces. Having no seas to cross, there was no need for him to embark and disembark his troops. He could always be marching on. In 1580 the brigand chief attacked and carried by assault Sbir, the capital of a powerful descendant of Genghis Khan. Ever since the province has been called Sibir, or Siberia, from the name of the conquered capital. Streams of Cossacks followed and spread in every direction from the path he had marked out. In 1649 Khabaroff, with three cannon and one hundred and fifty men, marched to the extreme east and occupied the Amur Basin. That territory then owed a nominal allegiance to China, and from it the Russian adventurers were compelled to retire by the treaty of Nevshink. Meanwhile resolute explorers and pioneers had been pushing northward and eastward all over the trackless waste which lay between Russia and the Pacific. Meanwhile in America men as dauntless and determined had been pushing westward from the Atlantic in continuous warfare with nature and the Indians.

Nicolas Nicolaievitch Muravieff was made governor of eastern Siberia in 1847. He was the son of an illustrious father and one of five illustrious brothers, all of whom served Russia well. He realized that what the Nile is to Egypt the Amur is to Siberia. It was then an almost unknown river. In obedience to his orders, Lieutenant Nevelsky made forty-five ineffectual attempts to find its mouth. He succeeded only at the forty-sixth. Herein is illustrated both the geographic ignorance of the time and the tireless persistence of the Russian.

Muravieff sent to the Chinese Government at Peking asking permission to navigate the river. Without waiting for an answer that would probably never come, he embarked upon its bosom May 18, 1854. It was the time of the Cri-

mean War. Allied Great Britain, France, Turkey, and Sardinia were hammering at the ramparts of Sebastopol, which they finally took after a siege of three hundred and fifty-one days and the loss of over 100,000 men. In 1860 Count Ignatieff, "alone and unsupported save for Russian prestige," obtained from the Chinese Government its signature to the treaty of Peking. Thereby the left bank of the Amur and the right bank of the Ussuri were ceded to Russia. In point of fact, China in no way suffered from the cession. She had derived no revenue from the ceded territory and had never sent governors into it or exercised any control over it. None the less, that acquisition was to be so momentous in its consequences that, in comparison, the temporary check received by Russia at Sebastopol was a bagatelle. By that treaty the first conquest of Siberia became complete. In its entirety it recognized the authority of the Tsar. From the banks of the Neva north of the Altai Mountains as far as the Sea of Japan the whole prodigious tract was under a single rule. While the world looked on, Russia, almost unconsciously, was shifting her maritime base; alone of the European states, she from her continental dominions looked out upon eastern seas. Though other western nations held isolated ports and islands in eastern waters, Russia alone reached and dominated those waters by broad territorial possessions that were continuous.

VLADIVOSTOK

Though holding a coast line of many hundred miles along the Pacific, she then possessed no city or inhabited tract adjacent to a harbor upon its shores. In 1861 forty men were sent by Alexander II. They landed at the head of a bay bearing the significant name of Bay of Peter the Great, at the extreme southeastern point of the Russian possessions in Asia.

Erecting a fort, with a presumption that seems amusing, they gave to the spot the name of Vladivostok, "The Mistress of the East." Other fortifications were erected, and a city speedily arose, which boasts over 40,000 inhabitants today. It is lighted by electricity and shows every indication of western progress. Its erection on that splendid and potential harbor is a typical illustration of the fruits that spring from the establishment of Russian Government in Siberia.

PHYSICAL CONDITIONS IN SIBERIA

In discussing Siberia, statements of dimension and distance confuse and bewilder rather than enlighten. It is of small advantage to dwell upon its area of over 4,900,000 square miles. If the forty-five states which compose the American Union were taken up and planted bodily in the midst of Siberia, they would be enclosed in every direction by a wide border of land. In this border territory all the countries of Europe except Russia could likewise be planted bodily, and there would remain still unoccupied 300,000 square miles, an area twice the size of imperial Germany. We have now to consider certain gloomy and repellent facts that at first discourage speculation and half paralyze hope. Only as we realize what Siberia is, only as we consider the immense disadvantages as well as the advantages of its geographic position, can we take into full account what Siberia is and what it will be. The victory of arms is complete. The victory of settled life, of laborious industry, of applied science, is but begun. But the hero who carries the sword is inferior to the pioneer, and the colonist who wars with unwilling nature utilizes its locked-up resources and compels it to serve him. The southeastern portion of Siberia is an immense plateau in the midst of mountains. Toward the west and

north it takes the form of a prodigious plain, which descends gradually to the Arctic. Plain and plateau are alike north of the fiftieth degree north latitude—that is to say, that its most southern points, except along the Amur and the Usuri and in west Siberia, are farther north than any locality in the United States. Its Cape Chelyuskin, in $77^{\circ} 36'$ north latitude, reaches nearer to the Pole than any other continental spur of land in either hemisphere. Shut in by mountains from the Pacific and the south, Siberia is open and without protection to the winds from the Arctic. So, scattered over its surface, are tracts unsurpassed in intensity of cold. In this regard Verhoyansk has the preëminence. Its average temperature during the three winter months is -53° Fahrenheit, while sometimes an extreme of -90° is reached. Its average annual temperature is only two degrees above zero; yet even there human beings cling like the moss and lichens and manage to exist the whole year through. The trend of land gives a northern direction to the masses of water—the Obi, the Yenisei, the Lena, and their tributaries—which we call rivers and which for months through much of their course are frozen rather than flowing seas.

THE ZONES

The 4,900,000 square miles of territory naturally divide into three roughly parallel zones. North of an imaginary line, in general coinciding with the sixty-ninth parallel, is the zone of the tundra. Here are comprised about 1,600,000 square miles. In a part of this territory the ground is frozen throughout the year, in winter to the depth of 40 feet, yet something like 100,000 human beings know no other home than the tundra. Between the sixty-ninth and sixtieth parallels is the forest zone, covering an extent of about 2,320,000 square miles and containing a population of less

than 1,000,000. The supply of timber is practically exhausted. Its fur-bearing animals render it above any other part of the globe the land of the fur hunter. Its broad rivers are packed with fish. Its wealth of minerals and metals is accessible in the very surface of the ground. South of the sixtieth parallel is the zone of arable land, embracing about 900,000 square miles in a belt nearly 4,000 miles long and from 250 to 300 miles wide. This is the Siberia which today counts the most. It is the part now being brought into intimate connection with the rest of the world. The prime requisite for its development has been inhabitants, and then means of communication and transportation. Beside unequalled capacity for the production of cereals, it is dotted all over with great deposits of coal, iron, gold, and the most useful and valuable minerals and metals. The word Altai means golden.

COLONIZATION

But in the mind of the Russian, no less than of the foreigner, Siberia up to a few years ago has meant only suffering and exile. It seemed set apart by God and the Tsar as the prison-house of the outlaw and the felon. In 1899 a ukase of Nicholas II forbade the entry hereafter of convicts and suspected persons, and thus ended its woeful old-time mission forever.

From the dawn of creation up to the present time Siberia has been waiting even as North America waited through the ages for the states that were to arise within its boundaries. In 1888 its real colonization began when 26,000 immigrants crossed its frontiers. Then 30,000 came in 1889, 36,000 in 1890, 60,000 in 1891, 100,000 each year from 1892 to 1896, then 150,000, 200,000, and now more than 250,000 annually. While excluding undesirable persons, the government adopts generous measures toward

worthy immigrants. To every family, when desired, it advances \$25 for the expenses of the journey, assigns gratuitously 40 acres to each man on his arrival, and further promises to assist with a loan of \$50. The only great landlord is the emperor or the state. Serfdom has never existed east of the Urals. Even political conditions, as affecting the colonist, are not greatly unlike those west of the Mississippi before the construction of the Pacific Railroad. The present population is over 7,000,000 persons. Among them are convicts and descendants of convict stock. None the less this class forms already an inconsiderable proportion. It is probably no greater, if as great, as among the Americans at the outbreak of the Revolution.

The impartial story of immigration to the trans-Atlantic colonies in the seventeenth and eighteenth centuries is not congenial to our ancestral and material pride. Nine of the colonies were officially penal stations, to which about 2,000 convicts were sent annually for many years. From 1715 to 1765 more than 70,000 such persons were sent over, among them 10,000 from the Old Bailey alone. In 1787 Botany Bay was made a convict station, that it might in that capacity replace the then independent American States. It is estimated that today in the newly federated Commonwealth of Australia through the veins of three persons out of every seven flows convict blood. In Australia, as in America, what was evil among the early settlers has been largely absorbed in the virgin political soil. Among a new people only the brave and hardy qualities tend to perpetuate themselves and to endure. So is it and so will it be in Siberia. Adullam's Cave, first the rendezvous of outlaws, became the scene and source of heroism and accomplishment unsurpassed in the Bible.

In the "Awakening of the East," Pierre Leroy-Beaulieu gives a vivid

picture of the various groups of present colonists at their nightly campings, the men unsaddling the horses, the women going to the springs and preparing food, the children playing, and some old man seated by the roadside reading the Bible to attentive listeners. The stock now peopling Siberia is that from which empires are made. Partially delivered from old traditions, equal in the democracy of labor, and forced to meet new conditions and new exigencies, Siberia is to solve political problems with which old European Russia is unable to grapple. The sun of political regeneration in the Russian Empire shines from the East.

WORLD ROUTES

The currents of history are prone to follow the beds of rivers, and commerce at first wanders along the roads which nature herself has marked out. Until four centuries ago the East and the West poured toward and across the Mediterranean to reach and benefit each other with the products of their agriculture and industry. The discovery of the Cape of Good Hope and the circumnavigation of Africa forced the abandonment of this ancient route, dealt the death blow to the princely cities of the Mediterranean, and centered the world's front in the British Islands and Holland. Now we are the amazed spectators of the beginning of that which is to make the world again change its base—commercial, political, strategic, and perhaps religious. Words can hardly exaggerate the momentous significance of the Trans-Siberian Railway, a work not yet completed, and the parts already in operation not yet beyond the initial, experimental stage. Even when its rails are at last in place and Vladivostok and Port Arthur are in full connection with St. Petersburg and Odessa, and the trains conveying passengers and freight begin to run with regularity and dis-

patch between the distant termini, the incalculable consequences of the vast enterprise will be only in their beginning. Every time the whistle of the locomotive blows, in its blast is the call not to resurrection—for in that northern Asiatic vastitude there is no dead past—but to the new, first birth of Siberia.

TRANS-SIBERIAN RAILWAY

In 1891 the first coupons were issued for the building of this railway. In December, 1892, the work was begun. A highway was to be pushed from St. Petersburg to the Pacific, a band of steel 5,852 miles long, binding the extremities of the empire and over its polished track affording an unrivalled route for the commingling of East and West and of their measureless products. From Paris to Vladivostok the journey by passenger and traffic was to be made in twelve days, and later on in ten. From Paris to Peking in thirteen days, to Hongkong in seventeen days, diminishing the expense in money and in time by a third or a half.

This railroad was to be financed, constructed, and administered not by private enterprise but by the state. Hence its object was not by financial returns to swell the revenues of giant corporations or individual capitalists. The profit and loss account on its pecuniary side was a minor consideration. Its single design and aim was to strengthen and develop the Russian Empire, and as an ultimate result to insure that empire the dominion of the East, the mastery of Asia.

THE RAILWAY A DETERMINING POLITICAL FACTOR

As the strategic position of Russia over against Asia is unique, so is this railroad unique in its possibilities. Whatever acquisitions Great Britain or Germany now holds, or may hereafter obtain on

the Asiatic continent, those possessions are remote by thousands of miles from their base, and their efficiency depends upon a difficult and precarious connection through those thousand miles of sea and land. Nor can those possessions be brought into much more intimate relation with each other and with the home empire than they already are. That is, for Great Britain or Germany or any other power to devise a political or strategic rival to the Trans-Siberian Railway is an utter impossibility. It remains, and must remain, the most stupendous agent in determining the destiny of the globe that has yet been conceived by man. It is to be maintained, as it was first originated, under the most favorable geographic circumstances which a state has ever enjoyed for the accomplishment of a gigantic undertaking. There is no assertion here that as an achievement of engineering skill this railway surpasses or even equals a trans-American railroad from New York to San Francisco, or a trans-African railroad from Alexandria to the Cape. Viewed merely as a railroad, it may in every respect be inferior to either; its trains may be less commodious or less luxurious, its locomotives less powerful or less swift, its technical management less efficient or less sagacious; but, regarding simply geographic position, having in mind only where it runs, what it connects, and what it must inevitably effect, nowhere can experience or imagination suggest a rival. The nearest approach to rivalry would be afforded by some line crossing China from west to east. But the western terminus of such a line would of necessity be close upon Russian Siberia or Russian Turkestan; it would traverse only a moribund or disintegrating Asiatic state; and whatever might be the governing board of its construction and administration, it would indirectly, if not directly, be subject to Russian influence.

RUSSIAN POWER

The Russian Empire is the largest economic unit in the world, and disposes of a larger capital than any other corporation, all under the impulse of a single will. In Siberia more than one-third of the land—that is, more than 1,700,000 square miles—is the property of the government. To open up the fields, and utilize the rivers, and work the mines, and push the industries, and swell the armies, only men are needed, and we have seen how every possible facility and encouragement is afforded by the government to the desirable colonist. The supremacy of mind over the obstacles of nature is as yet far from complete. Though man can resist heat and cold better than any other animal, he is still profoundly affected by its extremes. Science, at the rate of five or six miles an hour, can drive the ironclad of 2,000 or even 10,000 tons through ice 8, 10, and 12 feet in thickness, and between the piled-up frozen walls open a path for commerce to follow in its wake. Each coming year is to see, as each recent year has seen, some new advance over barriers once deemed impassable, some new victory over obstacles once deemed invincible. What may not limitless resources effect when put at the disposal of profound sagacity and of absolute will!

Material advancement is by no means all nor is it the chief consideration. The whole Russian political system has been built upon the broad substructure of Slavic nature as that nature has been shaped by its geographic environment. However repugnant to every instinct of our American life that system may be, it is no creation of accident or arbitrary caprice, but of the inflexible circumstances that determined its form. In new conditions in the larger area and on an even vaster scale, it is again to be adjusted in the manner most congenial and most beneficial to the Slav.

A RUSSIAN MONROE DOCTRINE

In America we still cherish the Monroe Doctrine and regard it as an essential part of our international law. Russia's boundaries in Asia stretch for more than 4,000 miles along the frontiers of Asiatic states, and she is vitally affected by the conditions, by the disturbances and disorders existing in those states. In comparison, no other European nation is affected by them. By what might be called a Russian Monroe Doctrine, which would be as justifiable and as logical as our own, Russia might claim to be the sole guardian, and, in necessity, the sole arbiter of her Asiatic neighbors. Siberia and the Trans-Siberian Railway are in time to render such procedure a fact. Russia, not so much pursuing a definite Eastern policy as fitting in to the exigencies of her Eastern situation, has acted and still acts in the old hemisphere exactly as the United States have acted and still act in the new. She has simply conformed to the law of her being and to the logic of events. The "rectification of frontiers" to the advantage of the more powerful has been the course which the greater states without exception have followed from the beginning and will probably follow to the end of time. The continuous history of the United States and of Great Britain in particular debar those nations from drawing up indictment against Russian aggression in Manchuria or anywhere else. Maladministered by the Chinese as far as it has been administered at all, never an integral part of China proper, the already virtually accomplished absorption of Manchuria by Russia furthers the welfare and prosperity of that province and of the Eastern world.

RUSSIA AND THE EAST

The recent troubles in China present only an acute but temporary phase of the

greater Eastern question. The smaller Eastern question centers upon the Bosphorus, and is that wherein Constantinople and the Ottoman Empire are involved. Formerly it seemed to cover all the political sky. It is overshadowed today by the problem of surpassing magnitude still farther east. The factors in the greater Eastern question are various and many; yet there is one factor that dwarfs them all. It is Russia in her expanding, vivifying march across Siberia. With her, as with no other nation, goes what to the Oriental counts more even than armies, and that is prestige. Her only possible Asiatic antagonist is Japan; but the nature which thousands of years have inwrought cannot be radically changed by the signature of a parchment or by an act of the will. The Oriental kisses not the hand

he loves the dearest, but the hand he fears the most. Despite the newly assumed garments of western civilization, the Japanese are Oriental to the core. The only European nation which can at all vie with Russia is Great Britain; but in such possible contest Russia would strike from near at hand and Great Britain from far away. Moreover, not only have Great Britain's hands been tied and her resources strained, but her military renown has, as the Oriental judges, been shattered in the South African war. Divergent interests and mutual jealousies prevent a combination of European powers under her leadership against Russia, such as she was able to accomplish against France in the Napoleonic wars. From the background of Siberia one figure stands forth distinct—the triumphant Slav!

GERMAN GEOGRAPHERS AND GERMAN GEOGRAPHY

BY MARTHA KRUG GENTHE, PH. D., ANN ARBOR, MICHIGAN

OF the countries that have taken an active part in the development of geographic knowledge Germany has always ranked among the foremost. The love of travel, of strange adventure, of tales true and tales false which touch the imagination, is innate in the Teutonic race. It made the northern Vikings discoverers of America long before Columbus; it unveiled to them the inhospitable coasts of Greenland and Iceland; it gave rise to the first known North Polar expedition—the expedition *in ultimam septentrionis axem* of 1140 A. D., of which Adam von Bremen has left us an account. Indeed, we may trace it down even to the recent travels of the heroes of discovery of the last century; for, unlike the explorers of

most other nations, the German travelers were uninfluenced by political or economic motives. It is only within the last twenty years that Germany has begun to found colonies; yet it has not been the absence of the colonial spirit or blindness to the advantages of colonization which kept her in the rear. We know that when the New World was discovered German merchants, the Fuggers of Augsburg, then the chiefs of the East Indian commerce, were quick to grasp the possibilities of the situation, and founded branch establishments of their houses in Lisbon, and in the coffee and cocoa districts of South America; but the sad political conditions of the empire at that time put an early end to these aspirations, just as it did to the attempts

of the Great Elector one hundred years later to found colonies on the coast of Guinea; and so the era which laid the foundation of the naval and commercial power of all the states of western Europe proved to be the ruin of that of Germany, since the lines of trade which had enriched it were now forsaken and the new ones were for her unattainable.

But so strong was the vitality of the geographical spirit in Germany that even those sad times could not quite overcome it. If the nation could not help being cut off from the actual progress of discovery, it could partake in it mentally. The eyes of German observers followed the navigators and explorers to the unknown lands across the sea; they listened to the reports that came from there, and wrote them down and printed and propagated them, and it seems that through all the epoch of the discoveries books of voyage and travel were in no country read more eagerly than in Germany. Peddlers sold thousands of pamphlets dealing with true and false stories of the fabulous countries of the West, and German *Landsknechte* left their homes and sold their services to the Spaniard and the Portuguese in order to get there. One of these men, Ulrich Schmiedel, wrote an account of his American experiences which to this day is one of the most interesting sources for facts relating to the state of South America at the times of the conquest.

DAWN OF MODERN GEOGRAPHY

With this elementary interest another and a higher interest went hand in hand. From the standpoint of natural curiosity which delights in the strange unknown, attention soon passed to the examination of the facts related, to the putting together and comparing of the different reports, to the distinguishing of what was true or false, important or unimportant, to the arranging and classifying of the

results obtained. Undisturbed by material and dynastic interests which in the conquering countries directed attention toward certain parts of the world, to the neglect of the rest, this quiet progress found in Germany the best conditions for development, and thus, while the *conquistadores* enriched their countries with gold and silver, the German geographers found treasures of another kind in discovering, or rather rediscovering, the scientific conception of the earth's face, the application to the enlarged cosmographical horizon of the scientific geographic methods of antiquity. In one word, they found the spirit of modern scientific geography. It was in Germany that the first globes and charts of the world were made, that in consequence of this a thorough reform of map-drawing and projection took place, that the idea of the atlas was first conceived and realized, that the first modern descriptions of the world, and the first systematic handbooks of general and physical geography were printed.

BEHAIM

The Bavarian, Johannes Müller, known better as Regiomontanus (after his native city, Königsberg in Franconia), first thought of constructing an earth's globe toward the end of the fifteenth century; the idea was carried out by one of his countrymen, Martin Behaim, of Nuremberg. Behaim, one of the few Germans who took an active part in the great discoveries, had accompanied Diego Caõ on his voyage to the west coast of Africa in 1484-'85, and after his return made the famous globe still preserved in the "Germanische Museum" at Nuremberg, which has brought down to our days the image of how the world was conceived in the scientific mind immediately before the discovery of America, for the globe was finished in 1492, a few months before the arrival of Columbus at the land

of promise. We see on it distinctly the consequences of those errors of Toscanelli's chart, which made the Genoese estimate the distance much shorter than it really was, and thus encouraged their daring enterprise.

MERCATOR

In the line of map-drawing, Behaim, Regiomontanus, and others undertook a revision of the methods of projection. Gerhard Kaufmann, better known as Mercator, invented a new method specially adapted to the wants of charts of the world, which is still in use and bears his name as the well-known Mercator projection. It was he, too, who after another German, Örtel, or Ortelius, had first united into a volume several maps belonging together, chose for such a collection the name of Atlas.

NAME AMERICA

I wonder whether all Americans are aware of the fact that even the name of their continent is due to none but a German scholar: In 1507 Martin Waldseemüller, also known as Hylacomylus, of St. Dié, in the Vosges, edited a book called *Cosmographia Introductio*, in which he gave a translation of Amerigo Vespucci's description of his voyages. That was just the time when Amerigo's fame filled the world, while Columbus' disgrace overshadowed his merit, and evidently his name had never reached the quiet village in the Vosges when Amerigo trumpeted forth his own glory. So Hylacomylus proposed that, since the new continent was, after all, not a part of the Indies, no name would suit it better than that of his famous explorer, Amerigo. The book was read far and wide, and so quickly was the proposition accepted that, when later on the true discoverer was known, the name was already rooted too deeply in general use to be abolished, and was even extended to the north part of the continent,

while Hylacomylus had only meant it for Amerigo's special stage, the present South America.

EARLY GEOGRAPHIES

Another *Cosmographia* appeared in 1524, by Apianus (Bennewitz); the *Weltbuch* of Sebastian Frank, in 1534; in 1544 the fine *Cosmographia* of Sebastian Münster, and Merian's *Topographia* added to its descriptions the most beautiful engravings, which today still delight the eyes of the geographer as well as of the lover of art.

These works of descriptive character were followed by attempts at rational investigation. After Francis Bacon had first pointed to the relations of discovery and philosophy, philosophers had never quite lost sight of geography. The question of effects and causes thus came into it, the distinction of different kinds and classes of phenomena, and their division and subdivision into larger and smaller groups; the foundation of geographic systems, and with it the germ of the scientific study of geography. Cluvérius' (Philipp Kluver, of Dantzic) *Introductiones in geographiam universam*, in 1629, was the first attempt in this line. In 1652 followed Varenus' (Bernhard Varen, of Hitzacker-on-the-Elbe) wonderful *Geographia Generalis*, in which we find the outlines of almost the whole domain of modern general geography, and in 1678 the learned Jesuit Athanasius Kircher published his *Mundus Subterraneus*, containing, among others, the first chart of the currents of the Atlantic Ocean, of a correctness which is marvelous considering the little knowledge of the time about ocean currents. Thus, though not materially connected with the great discoveries and conquests, Germany still held an honorable record among the fellow-nations, for hers was the intellectual and scientific conquest of the world which, when the others decayed and fell, remained as vigorous as before.

KANT

One of the most curious and admirable types of the learned German, who, though shut out from the world by forces stronger than he, yet with the eyes of the soul surveys and knows the whole world better than many others who have had all the advantages of voyage and travel, is Immanuel Kant, the philosopher of Königsberg. The work of this unique man in the development of geography, although through his whole life he never saw more than the environs of his native city, must never be forgotten. In his youth he was keenly interested in natural sciences, and through the reading of voyages and travels had acquired such a perfect knowledge of geography that during several semesters he gave lectures on physical geography and on anthropology, in addition to his philosophical lectures, and great was his renown also as an authority in nature problems. His most wonderful work in this line, however, equal to the *Critique of Pure Reason*, is the *Allgemeine Naturgeschichte und Theorie des Himmels* (General natural history and theory of the heavens), in which, forty years before Laplace, he exposed the formation of the earth and the solar system out of a rotating ball of gas, as it is now accepted. By a singular mischance the manuscript was lost at the printer's, and we know of it only through one of Kant's later works, in which he gives a sketch of this theory. Thus the great French mathematician could formulate the theory again and enjoy the glory of being the discoverer of the Nebular Hypothesis, which he well deserves, as he did not know Kant's book; but later times have rightly given this theory the name of the "Kant-Laplace Hypothesis."

HUMBOLDT

Like Kant, many of the leading German scientists of his time were attracted

to geography. We may name here the brothers Forster—Georg, author of *Ansichten vom Niederrhein*, and Johann Reinhold, the companion of Cook on his voyages—Leopold von Buch, the geologist, whose *Voyage to Lappland* is one of the finest specimens of geographical literature, and, above all, the great naturalist, traveler, and geographer, Alexander von Humboldt, the scientific discoverer of the Equinoctial Regions of the New Continent. In a course of lectures which he gave in later years at Berlin and worked out afterward into one of his finest books, *Kosmos*, or *Outlines of a Physical Description of the World*, he delineated the subjects and ends of geography in a most remarkable way. To him the thought first presented itself that besides the different departments of the special natural sciences, there was need of a general one which might bring the isolated facts of the others together and trace out of them the general features of the globe, or, as he expresses it, "consider the results of scientific research in its vast relations to mankind," and "recognize in the struggles of the elements that which is produced by a certain order or law." By this he ought not to be understood as wanting in a philosopher's way to derive the science of the earth by abstract theories from some fundamental principles; not at all. His geography, namely, description of the earth, was "the thoughtful observation of the empirical phenomena," and he repeats over and over again that "without a serious inclination for the knowledge of details every large and generalizing conception of the world would be nothing but a deceitful mirage," but that "the details of natural discovery possess an innate force of mutual fertilization." Thus "the unity of a physical description of the world is no other but that which is found also in the study of history." Both geography and history stand on the same empirical foundation, but the

thoughtful observation of natural phenomena, as well as of historical facts, must necessarily lead to the recognition of an old inner law dominating under the perpetual changes of material and intellectual forces. The geography of plants or of animals is then as different from descriptive botany and zoölogy as the geological knowledge of the earth is from mineralogy. His physical description of the world is therefore "not to be confounded with a so-called cyclopedia of natural sciences." In it details are only studied in their relation to the whole, as parts of the world's phenomena, and the higher this point of view the more this doctrine will become capable of individual treatment and enlivening report.

RITTER

By the side of Humboldt we meet with another man who, after Kant had explained the genesis of the earth and Humboldt had defined the basis of the scientific examination of its physical conditions, took up the question of man's influence upon and relation to geographical problems: it was Karl Ritter, in his *Erkunde im Verhältniss zur Natur und Geschichte des Menschen* (Geography in relation to the nature and history of man). We notice at once that a change in the meaning of the word geography has here taken place. Hitherto geography, according to the composition of the Greek root, had always been translated as "Erd- (or Welt-) beschreibung" (description of the earth or world), but it is now called "Erdkunde," a name which may be rendered only approximately by "knowledge of the earth." What Ritter wants to express by the choice of the name is that geography, whether physical or political, is not a descriptive discipline, as thus it would not deserve the name of a science, but a subject full of problems worthy of the most exact scientific and philosophic discrim-

ination. It not only imposes on the student a multitude of facts to be remembered, but introduces him into the secret laws ruling the natural and political history of the world, the precise recognition of which, of their influence on the development of nature and of man, is the object of geographical studies, without regard to practical and commercial purposes. In the introduction to his *Allgemeine Erdkunde* Ritter says: "This geography (Erdkunde) is called general, not because it intends to give everything, but because it investigates with *equal* attention and *without consideration of any special ends* the characteristics of every part of the earth and every one of its forms, whether it lie in the ocean or on the land, on a far-away continent or in our own country, or be the seat of a cultivated nation or a desert." These words form a milestone in the development of modern geography. They express for the first time unmistakably the program of the so-called comparative geography, which would be sorely misunderstood if it was thought a method consisting principally of questions like those found in so many text-books, "Compare such and such city, river, boundary," which is only a more interesting way to better remember certain facts. Such exercises are only the rude framework of real comparative geography. We may say that all comparative geography includes a certain amount of comparison, but that any geographical comparison does not represent comparative geography.

The results of such elementary comparison are the very beginning of comparative geography. After having obtained them, the real comparative work only sets in with inquiring after the different causes which produce them and the different effects which they produce. Then only we shall be able to actually compare the character of different parts of the globe, and dare to say that we know them. Of what value is

it to know the different numbers which represent the population of two states without knowing to what they are due? You may reply, "The principal thing is to know the facts. The farmer and the merchant little care for causes, provided that they know where to find the largest number of customers." Such an answer would be that of a tradesman, not of a scientist. Moreover, even the business man might gain by studying the causes of the variations of the market. Now, if such advantage is gained by this method even for practical interests, must it not be of far greater consequence for pure science? For science does not confine itself to the wants of the day; it pays equal attention to all the various problems, and thus, of course, obtains far more general and more trustworthy results. It was this question that Ritter first took up most energetically. That which makes geography a science, and penetrates the work of Humboldt as it did that of Varenus, shines out with perfect precision, in the words of Ritter, "without consideration of any special ends."

PURPOSE OF GEOGRAPHY

He who studies or teaches geography merely to acquire such a knowledge of geographical facts as is needed for traveling, or for the reading of newspapers, or for business enterprise, resembles the jeweler who knows all the qualities of the precious stones in his store. He is as little a geographer as you would call such a jeweler a mineralogist; but as surely as there is a way of knowing stones which constitutes a science called mineralogy, is there a way of knowing rivers, mountains, and dwelling-places which deserves the name of scientific geography. It is the way in which the study is carried on that makes the difference. Geography has its value in itself, and must be studied through itself, and for the sake of itself, not for secondary purposes. If practical ad-

vantage is also gained out of it, so much the better; but it is not the leading purpose.

GERMAN ACTIVITY IN GEOGRAPHY

This is the Credo of German geography, as represented at twenty universities, many of which possess quite a staff of professors, ordinary and extraordinary, private docents, and assistants in geography, together with a complete geographical apparatus of books, periodicals, maps, globes, pictures, photographs, lantern-slides, and the so-called "Geographisches Seminar" or institute, where practical courses are also given. In a territory considerably less than that of Texas, Germany has more than twenty geographical societies, who do valuable work in local or general geography, and send out travelers by means of special funds. They publish scientific reports every year, and besides these a dozen geographic periodicals are published by divers editors, some of which are only equaled by the publications of the Royal Geographical Society of London. Geography is taught not only in primary schools, but in the "Gymnasium" and high schools for from five to seven years, and there is now an agitation to give it a still wider extent in these schools, and to have it taught from beginning to end by teachers specially trained in the subject at the university; for geography is in the university studies a subject in which one can obtain a Ph. D. degree after three or more years' study on the university plan, and by the presentation of a thesis on a geographical subject which contains positive results of original scientific research. This is the present state of the movement started by Karl Ritter and his school.

BERGHAUS

The pioneer of the new ideas was Heinrich Berghaus, Humboldt's friend,

who in his *Länder und Völkerkunde* gave the first text-book, or rather hand-book, composed after the new principles; but more important than this is his Physical Atlas, which down to our times has held a fundamental and leading position in physical geography, and only recently has been imitated in an enlarged size by the great physical atlas which is now being published in London. After Berg-haus, Oscar Peschel became the head and the soul of geographic progress. During more than twenty-five years he edited one of the best geographic periodicals, the *Ausland*, and his books on Physical Geography, New Problems of Comparative Geography, Ethnology, History of Geography, History of the Age of the Discoveries, though partly supplanted by more recent publications, belong to this class of scientific literature.

RICHTHOFEN

A new epoch was opened by Ferdinand von Richthofen, the explorer of China and Peschel's successor in the chair of geography at the University of Leipzig. The address which he gave at his inauguration in 1883, *Über Aufgaben und Methoden der heutigen Geographie* (On the problems and methods of modern geography), became the program of modern geographers, and was indeed the first critical and systematic survey of the whole domain of geography. The program has been changed since in details, as all science undergoes constant change and evolution, but it rests to this day upon the foundation he presented.

In this treatise Richthofen first defines the limits of geography, giving as its special field of research the surface of the earth. Various are the phenomena which it offers, and which have been studied by various sciences; but geographical work begins with the problem of location of the different phenomena, with the question, Where?

The surface of the earth may be conceived in a double way: as a mathematical or a material surface. In the former meaning the geographer's work consists in measuring the earth's extent, which will lead him to define and to represent the relief on maps, and to subordinate the different results of his work to inherent laws, which will build up the morphological side of geography. Then this surface is also subject to cosmological influences; their investigation will need the assistance of astronomy and mathematics, and is called astronomical or mathematical geography. The material surface is composed of different substances, classed in three grand divisions—atmosphere, hydrosphere, and lithosphere—each of which consists of various components in various proportions at various times; geography must find out the local relations of the multiple problems and phenomena arising from these combinations. To this end it needs the assistance of meteorology, hydrology, and geology, without being itself one of these sciences, since it cares for them only for the sake of the consequences which their phenomena produce in the configuration of the surface. This is physical geography.

But the earth's surface is not a rigid one. It is constantly undergoing changes which arise from the different forms of life existing on it, and this obliges the geographer to also take the forms of life in consideration. For this he needs the assistance of botany and zoölogy, which again furnish him their facts in order that he may study in them the influence of location, of height, latitude, continental and marine surroundings, etc. These branches of geography are zoögeography and phytogeography.

At last we must consider the influence of man on all the preceding phenomena, and their influence on him. For this purpose the geographer must consult history, statistics, sociology, ethnology, and anthropology. Out of these investi-

gations he establishes the last great subdivision—anthropogeography.

It is impossible in this short review to enter into more than the outlines of this vast program; but even these show that we have to deal here with the foundation of all geographic work of the last fifteen years. From this time we must reckon the wonderful development of recent geographic investigation in Germany, represented not only by the name of Richthofen, but by the names of Penck, Suess, Richter, Brückner, Supan, Günther, Gerland, Drygalsky, Hettner, Phillipson, and others.

It was natural that, Richthofen himself having entered the field of geography from the geologic side, those branches of geography which are most closely connected with geology should have been most cultivated by him and his followers. Thus it happened that those geographic questions which are related to natural science received most of the advantage of the new impulse, namely, the problems of physical geography. It even seemed for some time as if the idea of scientific geography would be only applied to this division, as if geography was nothing but a subdivision of natural science. This opinion was even held by a party of the geographers themselves; but now, with the exception of a very small minority, of which Professor Gerland, at Strassburg, is the most important representative, it may be looked upon as a past epoch in geographic evolution. Valuable as the study of physical geography is, it cannot be denied that it is only a part of geography, not geography itself, and that the topic most alive in public interest, the question of human life, work, and influence upon the earth's surface, the so-called political geography, is just as indispensable. The study of physical geography alone would deal with the earth as a dead planet, a planet without life or history.

This disproportion between the pro-

gress of physical and the backwardness of political geography was naturally felt most sorely in schools, which would make the former a very interesting branch of teaching, while there was no way of learning the latter except by learning single facts by heart, since the knowledge of these facts was indispensable after all. For "no physical or geological wisdom," said then Professor Kirchhoff, of Halle, one of the foremost men in the progress of school methods, "will help him who does not know whether Madrid lies in Spain and Petersburg in Russia, or vice versa." Thus necessity led geographers back quite naturally from the overemphasis of physical geography to the further pursuit of Ritter's ways. It was recognized that such an important branch of instruction must needs have a scientific foundation, and that if this foundation had not yet been discovered, the reason might be that the right point of view had not yet been taken.

RATZEL

This point of view was found and Ritter's method taken up again with the improvements of modern science by Friedrich Ratzel, Richthofen's successor in the Leipzig chair of geography. We are reminded of Humboldt's remarks on the spirit of physical geography when we read Ratzel's words: "The complaints of the dryness of political geography, as old as geographic instruction itself, are heard again and again in our times. They seem to be the result of lack in pedagogic skill; but the fault lies deeper, it lies in the scientific treatment of political geography. For this is the cause of all the difficulties in this branch of instruction, that the facts of political geography still lie much too rigidly beside each other and beside those of physical geography. The instruction in this important branch will never be rendered interesting unless the

material is cleared up by classification and refined by investigations, paying special attention to comparison and evolution." (Preface to the *Political Geography*.)

The first attempt in this direction was the *Anthropogeography* (Munich, 1882), or *Outlines of the Application of Geography to History*. Although the book was not spared opposition from the first, it started a new epoch in geographic research, and after various special works on the same subject, a second volume followed several years later. In 1896 a treatise, *Der Staat und sein Boden*, published in the Proceedings of the Royal Saxon Academy of Sciences, gave the problem a still closer connection with political questions, and in 1897 the author published a new standard work, containing the application of the scientific method to the very political geography which had so long been only a list of names and numbers, the *Politische Geographie*. The word political in this title stands for more than a mere nomination; the aim of the book is to define the close connection of politics and geography in a manner which makes it valuable equally for the statesman and for the geographer. The author hopes it may give the former a better understanding of geographical, the latter of political, influences in his sphere of interest, and thus awake, not only in teachers, but in all his readers, of whatever condition, what he calls "geographischen Sinn," geographical feeling, just as we speak of acquiring the feeling for a language in philological studies. To him, states are organisms in various stages of development, and they are made geographic organisms by being most closely bound to the soil on which they develop, penetrating deeper and deeper into its resources. As such geographic phenomena they can be observed, described, measured, drawn, compared like every other phenomenon of life on the earth. The mistake of

former political and sociological theories was that they dealt with a too theoretical conception of the state—a state, as it were, which stands in the air, and which owns the soil as a kind of large property. But we must put that airy state on the solid foundation of the earth, and then we shall get a living conception of the political side of geography. According to this programme, the author deals in nine chapters with the following topics: The State and its Soil; the Historical Movement and the Growth of States; Fundamental Laws of the Increase of the Area of the State; Situation; Area; Boundaries; Land and Sea; the World of the Water; Mountains and Plains. He presented one year later the application of his principles in the little book entitled *Deutschland*, which every one who wishes to obtain an idea of modern German geography should read.

WHAT IS GEOGRAPHY?

Geography, then, as carried on in Germany, is a field of manifold studies. It requires the knowledge of mathematical and physical geography, including map-drawing and surveying, oceanography, climatology, geography of plants and animals, anthropogeography, political, and commercial geography, history of geography, together with a general acquaintance with the cognate sciences, such as geology, physics, ethnology, history, political economy, and philosophy, and also, if possible, with botany, zoölogy, and anthropology; but even this would not yet make a geographer. We must remember Humboldt's words, that geography is not "a so-called cyclopedia of natural sciences," and that from the knowledge which the sciences impart we must always proceed to the consideration of the whole. The whole, as shown in Ratzel's *Deutschland* and a number of similar publications, consists in the application of this general knowl-

edge to a certain region of the surface of the earth, the so-called "Länderkunde" of German geography, which is no longer a mere description of the different countries, but a scientific investigation of their characteristics. It is quite significant that no other language has an exact synonym of this denomination, a fact which more than anything else shows that it is a German specialty of entirely German origin. The "Länderkunde," so often called very inadequately "descriptive geography," is represented at German universities, as well as general and systematic geography. Every professor will, beside these courses, devote a large part of his time to a single country or continent, which always is the most interesting part of the whole study.

ELEMENTARY TEACHING

In school geography "Länderkunde" is of course the dominant subject, to which all general geography has only a subordinate and tributary relation; for to children's eyes we must never present the dry and, to them, sterile facts of systematic knowledge. It is applied science which fits a child's understanding and rouses his interest. If we want children to pay attention to effects and causes we must let them see things and incidents in which they operate, give them a picture of concrete life, not abstract reflection. Now, in order to thus embody the principles of geography, no better means can be found than "Länderkunde." A course in geography that opens with a definition of geography and of the primary notions of the geographic vocabulary, and which gives an introductory course on the principal subjects of general physical geography before taking up the study of a definite part of the earth, would not only be very unpsychological, but do also the greatest harm to geography itself. For to the young learner who has to

put such generalizations into his brains without enough knowledge of details to make him feel their general truth geography will appear nothing but a complexity of phrases to be learned by heart, and this preconception will cause him to look at all the following geographic data from a wrong position; all the special facts will be received by him only as illustrations of the preceding principles, just as formerly in the teaching of languages the spoken language appeared only as a collection of examples to apply grammatical rules; but this was putting the cart before the horse. This same mistake has often made geography a very dull subject, while it can be one of the most interesting, even for young minds. The secret of a successful teacher of geography, as of languages, is to give the pupil a whole and living unit, of which his imagination may get hold, and to present the unit so that he will feel the leading principles before he has learned them separately. Thus their necessity impresses itself upon his mind spontaneously, instead of being demonstrated to him as a scientific Credo.

In such a course it is then not permitted to treat a continent or a state or another district first physically and afterward, perhaps a year later, politically, or even, as I have seen in textbooks, first politically and then physically, or to treat the subject by classifying the details under special headings, as relief, watershed, productions, dwelling-places, etc., through which the causal connections are inevitably torn asunder. Instead of this the teacher will, after a short general survey of the whole, divide it up into a number of smaller units or natural regions, within which he will treat the different topics and their mutual influences upon each other. He will make, as it were, a horizontal section through the vertical columns of the topics named above, and work out the picture given by each of these sections as an individual subject and in its rela-

tions to its neighbors. After this a short historical sketch, with sufficient reference to the geographic conditions of the historical development, will furnish the basis for an examination of the political contours of the map, in which much repetition of the preceding lessons will come in. Reciting the geographic facts according to special topics may be used as a means of repetition, as a help to the pure memory of names, but even then must never be done without always pointing out on the map the location of the places mentioned. It is, however, absolutely to be condemned as a part of the lesson, because it kills the geographic feeling.

The first country studied in this way is, of course, the native country, especially the home of the child and its environs. This home geography fills the first year and gives opportunity to make the child acquainted with the preliminaries of general geography, not in a systematic, but in an inductive way, and to introduce it to the thoughtful use of the map. Map-reading may be carried on to a very high degree of perfection, and even furnish positive knowledge of phenomena which cannot be studied in nature, if map-drawing for school purposes is done with such perfection as in Germany, where the principle that for children the best things are just good enough has exercised a wonderful influence also in this direction. The cartographic productions of Debes (Leipzig), Perthes (Gotha), and Reimer (Berlin) have no peer in any country. In a German geography class, therefore, you can observe that the teacher really gets his pupils to read the cartographic representations like letters in a book, to use the map as a directory in walking, to find their way easily in unknown places by the aid of the map, and perhaps we have here one of the reasons why Germany more than any other country is the home of pedestrian trips and of travelers' guide-books.

In the second year follows the study of Germany, after this a general survey of the globe and continents, then the special study of Europe and of the foreign continents. It is not until then that the systematic teaching of general physical geography begins, which is now indeed nothing but the repeating, putting together, completing, and systematizing of what the pupils have already learned in the former grades in an occasional and inductive way. Part of the schools make this the final course; others take after it a second and more advanced course of the geography of Germany, with special attention to political, social, economic, commercial, and colonial problems, for which mature pupils are better fitted than the children of the first German course. Thus on leaving school they have a clear idea of the actual state and conditions of the country in whose life they are to participate. On the whole, the average German who does not pursue higher studies will have from seven to nine years of geography, with generally two hours a week for 40 weeks each year. This makes about 550 to 700 lessons in the whole course, or 17 per cent of all the instruction imparted outside the university.

WHY STUDY GEOGRAPHY?

It seems proper to ask why German educators lay so much stress on geographic training. What is the value of a thorough study of geography for education and for life?

There are, of course, a number of practical reasons. The knowledge of many geographic facts is so necessary for everybody that even when no higher merit had yet been found in it, the study of geography was included at least in the schedule of primary schools.

As to scientific geography, the question has often seemed not very easy to answer. It has been objected that if

geography comprised all the various branches named above, it could hardly be called a science, but was rather an agglomeration of fragmentary knowledge borrowed from a dozen other sciences, the study of which was an impossibility even for a first-rate intelligence, and must needs lead to a kind of half knowledge of everything which was the very contrary of scientific work. It has been one of the most serious tasks of geographers to refute this objection which has been repeated most obstinately over and over again, as it arises from an entire misunderstanding of the geographical spirit. In the first place, there is no science now known in which one mind can have an equally complete command of all the subdivisions; even the greatest men in medicine, zoölogy, history, etc., are specialists in some definitely limited area, while they merely keep up with the scientific progress of the rest and leave other specialists to do other special work. Yet nobody will accuse them of superficiality. Why should not the geographer enjoy the same privilege? But even if it were possible for one man to have a perfect and up-to-date knowledge of all knowledge connected with geography, that would not make him a geographer. Geography is not a "cyclopedia" of all the enumerated sciences. That is the point where erroneous judgments on geography generally start. It is not the number and character of the facts which constitute geography, but the ways and methods in which they are studied. This is what makes the geographic spirit and what gives geography the character of a separate science apart from all the others, however closely connected with them in many points.

Thus, for example, the physicist may study, describe, and explain the deviation of the compass or the differences of temperature of the atmosphere; but the geographer (Humboldt) will locate on the map the points of observations and

connect equal observations by lines, and from the arrangement of these lines draw conclusions as to the influence of magnetism or temperature upon the surface of the earth; or the statesman will draw and claim boundaries for the state which he represents for such and such reasons; the geographer will look at and compare the boundaries of the states in different parts of the world, find out the laws active in their formation, tell us why certain boundaries have always been objects of contention while others never were disputed, and explain the present boundaries, their origin, and their importance for the life of the nations (Ratzel); or the geologist will study and explain the different strata of the earth's crust; the geographer (Brückner) will examine their distribution over the surface of the globe, compare it with the present arrangement of mountain ranges, and explain out of the geologic past the features of the geographic present. In whatever problem the geographer may be interested, the object of his investigation must be connected with the earth, the earth's surface as a whole and as the primary unit. However interesting may be the object of his special research, he cannot allow himself to be entirely confined to it without ceasing to be a geographer.

POINT OF VIEW

The poet Jean Paul says: "There are two ways of enjoying the world. One is to lie down in the grass, look at the green stalks and pretty flowers about you, watch the humming insects, and thus fondly take in all the wonderful revelations of life which present themselves in this seclusion. The other is to rise up high in the air like a bird, so high that all the little and mean things vanish from your view, and you only behold the whole of the great, wonderful creation beneath you."

In geography both methods are combined. By the peculiar character of its

procedure, which requires a scrupulous examination of the detail, together with a wide survey of generality, it exchanges constantly the small circle of special research and the wide field of generalization. Must not such a change between restriction and expansion be most helpful? It is a fact that the type of the learned specialist who is almost a stranger to the problems beyond the limits of his own work is in no field so rare, if not so totally absent, as in geography. The broadest-minded people of the fine staff of German scientists, the most alive to the interests of the world about them, are met with among the professors of geography. Geography forces its apostles to keep constantly apace with all the progress around them. In no other field of study would the neglect of almost any question of the day, scientific or not, prove more fatal than here. The introduction of the study of geography into the universities, therefore, is a powerful ally to keep the students from becoming narrow in their views, from looking no further than the small circle within which the axis of their own special interests rotates. It will make them tolerant by teaching them to understand different conditions, and to make allowance for different consequences arising from these different conditions. It will make them wise and successful in contact with political questions, because they will not expect nor exact from foreign nations more than they can afford, according to their actual state and circumstances.

UTILITY OF GEOGRAPHY

Geography, more than almost any other science, has the power to enrich the lives of those who devote themselves to its study. The botanist may teach you the secrets of the life of trees and plants, the zoölogist introduce you into the interesting ways and habits of many a little fellow-creature, the geologist

open your eyes for the charms of tracing the history of the soil which you tread, but none gives you such an entire and satisfactory feeling of nature as geography. It is the entirety of the impression upon which stress ought to be laid. The natural disposition of the average mind goes to the whole. Even a good botanist or other scientist will be specially interested only in part of what surrounds him, be it plants or animals or stones, sometimes even only in a certain class or family of them. Geography teaches you to enjoy nature as a whole. It tells you why the soft lines of this mountain range, covered with dark firs, slope so gently down to the valley, while yonder ice-capped summits tower up steep and bold to the sky. It shows you why here waving cornfields reward the farmer's labor, and why another region seems to be one enormous meadow.

Geography will contribute, too, to improve the character and adorn the life of the student. It will make him feel familiar and at home on almost every spot of the earth; nowhere will he stand criticising and complaining of what is different from his native place, but appreciate the differences of nationality, and instead of repining for what cannot be changed, come home enriched by the touch of many a string in his heart which would never have resounded under other circumstances. In the character of the German nation we see this side highly developed, too highly even from certain points of view. The readiness with which the German adopts foreign customs when he goes abroad, as well as when they are brought to him, the facility with which as an immigrant he accommodates himself to the conditions of his new home is in great measure due to his highly developed feeling of geographic equity. A reasonable portion of it added to national character would be an improvement for many races.

Political geography, especially, must

not be forgotten when we deal with the advantages of geography. Much information of high value is offered through it to the student. Economic and social problems, questions of government and constitution, which when treated in an abstract and theoretical way will often fall short of the understanding, as well as of the interest of young brains, find here wonderful material for exemplification, object-lessons in public life, poli-

tics, economy, and sociology. Enormous treasures lie hidden here, waiting only for the right digger to discover them. In a country where interest in public affairs is so strong as in this great Republic, this duty of the schools should be cherished most conscientiously. Geography should be given the place which it deserves, not only in elementary instruction, but also in all high schools and universities.

THE DRIFT OF FLOATING BOTTLES IN THE PACIFIC OCEAN

BY JAMES PAGE, U. S. HYDROGRAPHIC OFFICE

AMONG the various investigations carried on by the U. S. Hydrographic Office, there is one which has always excited greater or less popular interest, owing probably to the fact that it lies within the power of any one who is at sea, and who is likewise gifted with a reasonable amount of curiosity and the leisure time to gratify it, to contribute toward the end in view. This particular field of research is the investigation of the surface currents of the sea by means of the knowledge obtained through the drift of floating bottles, or, as it is familiarly known, the drift of bottle papers. The apparatus required is not extensive. The date, the latitude, and the longitude of the vessel at any given time are written upon a piece of paper; this paper is then placed in an empty bottle of whatever character is nearest to hand; the bottle is then corked and sealed and cast into the sea. After the lapse of time, sometimes of years, certain of these bottles find their way to the coasts of the adjacent continents or islands, and the papers contained in them ultimately reach the U. S. Hydrographic Office.

The office assists in the investigation to the extent of furnishing the pieces of paper. These are prepared in blocks, and are distributed free of charge to the masters of vessels who promise to undertake the task of casting them adrift—a promise which, the results prove, is rarely violated. The paper is printed in seven languages in order that it may be readily understood, no matter upon what coast it ultimately lands. The first part, which is to be filled in by the person who casts it adrift, contains a space for the name of that person, for the name of the vessel, the date, the latitude, and the longitude; the second part, which is to be filled in by the discoverer of the bottle, a space for the name of the finder, the date, and the locality in which it is found. At the bottom of the paper the finder is instructed, in seven languages, to return the paper to the U. S. Hydrographic Office.

Several hundred of these papers find their way back each year, the great majority of those which are returned having been cast adrift in the Atlantic Ocean, and charts have from year to year appeared showing the drift of bot-

tles in that ocean. These charts all unite in showing a steady easterly drift in the temperate latitudes of both the North and the South Atlantic, and an equally steady westerly drift in the tropical latitudes, the generalized current system of either ocean thus consisting of a vast eddy about some central point, the direction of the circulation being anti-cyclonic in either hemisphere—*i. e.*, with the diurnal motion of the sun, as observed in that hemisphere, just as in the case of the prevailing winds.

Taken collectively, the lines of drift of floating bottles in the Pacific again show, precisely as in the case of the Atlantic Ocean, that the general direction of the drift is eastward in the higher latitudes, westward in the lower. At least this is so for the North Pacific. For the South Pacific evidence of the eastward motion of the extratropical waters is lacking. None of the drifts reveal the existence of the equatorial counter-current flowing eastward between the westward-moving equatorial currents of the southern and northern hemispheres. The average velocity of the easterly drifts is 4.4 miles per day, of the westerly drift 10 miles per day, or more than twice as great, which is again in accordance with the results for the Atlantic Ocean. The highest velocity attained was that of a bottle thrown overboard from the steamer *Warrimoo* January 23, 1897, in latitude 4° N., 168° W., and found March 6, 1897, on one of the Gilbert Islands, having drifted 1,100 miles in 42 days, or at an average rate of 26 miles per day. None of these velocities makes any allowance for the time during which the bottle may have lain undiscovered on the beach. The longest drift was that of a bottle which was thrown overboard near Cape Horn June 18, 1896, and found near Cape York, on the northern coast of Queensland, Australia, after the lapse of nearly three years. The shortest practicable route which it could have pursued meas-

ures 10,100 miles in length, or nearly two-thirds of the total distance around the earth in the latitude of its path, giving an average velocity of 10.1 miles per day. The actual distance traversed was probably much greater than this.

My main object in directing attention to these drifts is to suggest the idea that they illustrate an apparent paradox. The bottles themselves float upon the surface, but if I were asked whether the lines drawn upon a chart to show their course represented the surface currents of the sea, the currents with which the navigator has to deal, I should say *emphatically no*. The actual surface currents present no such uniformity, either in direction or velocity. As an example of this, take the currents actually observed in the five-degree square of the North Atlantic Ocean bounded by the parallels 35 to 40 degrees north and the meridians 65 to 70 degrees west (off the coast from Hatteras to Sandy Hook), in the heart, therefore, of what is ordinarily known as the Gulf Stream, concerning which the popular impression is that it flows along steadily like a mighty river. For any given month, say September, the currents actually observed within this square were as follows:

Setting northeast, 32 per cent of the whole number of observations ranging from 6 to 70 miles in 24 hours.

Setting southeast, 23 per cent of the whole number of observations ranging from 8 to 65 miles in 24 hours.

Setting southwest, 27 per cent of the whole number of observations ranging from 6 to 76 miles in 24 hours.

Setting northwest, 18 per cent of the whole number of observations ranging from 9 to 63 miles in 24 hours.

Evidently here there is none of the uniformity presented by the drifts and which the mind ordinarily associates with the Gulf Stream.

To get at the true meaning of these lines of drift beyond the fact that they represent the resultant of the traverse

line pursued by the bottle in its journey, it is necessary to go back to the motive power which gives rise to the surface currents of the sea, viz., the winds. A perfectly steady wind acting continuously on the surface of the sea will, through friction, give rise to a movement of the surface waters in the same direction as the wind itself. If the latter continues for a sufficient length of time the impulse, first felt only at the surface, will gradually communicate itself downward, owing to the viscosity of the water, and the lower strata to a successively greater and greater depth will thus partake of the movement until it is finally shared by the whole mass, the velocity of the motion diminishing as the depth increases. The rate, however, at which this motion is communicated to the depths of the ocean is exceedingly slow. It has, for instance, been estimated that in a depth of 2,000 fathoms a surface current of given velocity would require a period of 200,000 years to transmit its due proportion of this velocity to a point halfway toward the bottom. Similarly, when once established, these submarine currents exhibit a corresponding reluctance to undergo any variation in direction or intensity.*

Perfectly steady winds, however, do not exist, even in the region of the trades. The winds are constantly

changing, and the surface currents change with them. The lower strata of the ocean, however, are insensible to these changes, and at a considerable distance below the surface the waters of the ocean have probably a slow but perfectly uniform motion, the direction of the motion probably agreeing closely with that of the resultant surface winds.

We have, therefore, in the body of the sea two distinct sets of currents; first, those at the immediate surface, which move practically at the obedience of the surface winds, sometimes in one direction, sometimes in another: second, those of the lower strata, which are constant in direction and velocity and represent the aggregate effect of the winds that have blown for ages past, the sea in this respect furnishing a close analogy to the atmosphere, the motion of the lower strata of which is constantly disturbed, while that of the higher strata, as shown by the motion of the cirrus clouds, is comparatively uniform.

It is the motion of these lower strata, as I take it, that the uniform paths pursued by these drifting bottles to some extent represent, and it is the evidence contained in them that should be studied in investigations dealing with the currents of the ocean in their entirety, rather than the evidence obtained from any given set of current measurements made at or near the surface and for some given point.

* Zöpprits, *Annalen d. Hydrographie*, 1878.

THE BRITISH ANTARCTIC EXPEDITION

THE *Discovery*, carrying the British National Antarctic expedition, is now well on her way to South Polar regions. The proposed work of the party has been carefully outlined by the presidents of the Royal Society and of the Royal Geographical Society in their instructions to Captain Scott and

to Dr. George Murray, the scientific director. The instructions to the commander are as follows:

1. The Royal Society and the Royal Geographical Society, with the assistance of His Majesty's Government, have fitted out an expedition for scientific discovery and exploration in the Antarctic

regions, and have entrusted you with the command.

2. The objects of the expedition are : (a) to determine, as far as possible, the nature, condition, and extent of that portion of the South Polar lands which is included in the scope of your expedition, and (b) to make a magnetic survey in the southern regions to the south of the 40th parallel, and to carry on meteorological, oceanographic, geological, biological, and physical investigations and researches. Neither of these objects is to be sacrificed to the other.

3. The scientific work of the executive officers of the ship will be under your immediate control, and will include magnetic and meteorological observations, astronomical observations, surveying and charting, and sounding operations.

4. Associated with you, but under your command, there will be a civilian scientific staff, with a director at their head. A copy of his instructions accompanies these instructions to you.

5. In all questions connected with the scientific conduct of the expedition you will, as a matter of course, consider the director as your colleague, and on all these matters you will observe such consideration in respect to his wishes and suggestions as may be consistent with a due regard to the instructions under which you are acting, to the safe navigation of the ship, and to the comfort, health, discipline, and efficiency of all under your command. Those friendly relations and unreserved communications should be maintained between you which will tend so materially to the success of an expedition from which so many important results are looked for.

6. As the scientific objects of the expedition are manifold, some of them will come under the immediate supervision of the director and his staff ; others will depend for their success on the joint coöperation of the naval and civil elements, while some will demand the undivided attention of yourself and

your officers. Upon the harmonious working and hearty coöperation of all must depend the result of the expedition as a whole.

7. The expedition will be supplied with a complete set of magnetic instruments, both for observations at sea and on shore. Instructions for their use have been drawn up by Captain Creak, R. N., and yourself and three of your officers have gone through a course of instruction at Deptford with Captain Creak and at Kew Observatory. The magnetic observatory on board the *Discovery* has been carefully constructed with a view to securing it from any proximity to steel or iron, and this has involved considerable expense and some sacrifice in other respects. We therefore impress upon you that the greatest importance is attached to the series of magnetic observations to be taken under your superintendence, and we desire that you will spare no pains to ensure their accuracy and continuity. The base station for your magnetic work will be at Melbourne or at Christchurch, in New Zealand. A secondary base station is to be established by you, if possible, in Victoria Land. You should endeavor to carry the magnetic survey from the Cape to your primary base station, south of the 40th parallel, and from the same station across the Pacific to the meridian of Greenwich. It is also desired that you should observe along the tracks of Ross, in order to ascertain the magnetic changes that have taken place in the interval between the two voyages.

8. Geographical discovery and scientific exploration by sea and land should be conducted in two quadrants of the four into which the Antarctic regions are divided for convenience of reference, namely, the Victoria and Ross quadrants. It is desired that the extent of land should be ascertained by following the coast lines, that the depth and nature of the ice cap should be investigated, as well as the nature of the vol-

canic region, of the mountain ranges, and especially of any fossiliferous rocks.

9. A German expedition will start at the same time as the *Discovery*, and it is hoped that there will be cordial coöperation between the two expeditions as regards magnetic and meteorological observations, and in all other matters if opportunities offer for such coöperation. It is understood that the German expedition will establish an observatory on Kerguelen Island, and will then proceed to explore the Enderby quadrant, probably shaping a course south between the 70° E. and 80° E. meridians, with the object of wintering on the western side of Victoria Land, whence exploring sledge parties will be sent inland. The government of the Argentine Republic has undertaken to establish a magnetic observatory on Staten Island.

10. You will see that the meteorological observations are regularly taken every two hours, and, also, in accordance with a suggestion from the Berlin committee, every day at Greenwich noon. It is very desirable that there should, if possible, be a series of meteorological observations to the south of the 74th parallel.

11. As regards magnetic work and meteorological observations generally, you will follow the program arranged between the German and British committees, with the terms of which you are acquainted.

12. Whenever it is possible, while at sea, deep-sea sounding should be taken with serial temperatures, and samples of sea water at various depths are to be obtained for physical and chemical analysis. Dredging operations are to be carried on as frequently as possible, and all opportunities are to be taken for making biological and geological collections.

13. Instructions will be supplied for the various scientific observations; and the officers of the expedition will be furnished with a manual, prepared and

edited by Dr. George Murray, on similar lines and with the same objects as the scientific manuals supplied to the Arctic expedition of 1875.

14. On leaving this country you are to proceed to Melbourne, or Lyttelton (Christchurch), New Zealand, touching at any port or ports on the way that you may consider it necessary or desirable to visit for supplies or repairs. Before leaving your base station you will fill up with live stock, coal, and other necessities, and you will leave the port with three years' provisions on board, and fully supplied for wintering and for sledge-traveling.

15. You are to proceed at once to the edge of the pack and to force your vessel through it to the open water to the south. The pack is supposed to be closer in December than it has been found to be later in the season. But this is believed to depend rather on its position than on the time, and the great difference between a steamer and a sailing vessel perhaps makes up for any difference in the condition of the pack.

16. On reaching the south water you are at liberty to devote to exploration the earlier portion of the navigable season; but such exploration should, if possible, include an examination of the coast from Cape Johnson to Cape Crozier, with a view to finding a safe and suitable place for the operations of landing in the event of your deciding that the ship shall not winter in the ice.

The chief points of geographical interest are as follows: To explore the Ice Barrier of Sir James Ross to its eastern extremity, to discover the land which was believed by Ross to flank the barrier to the eastward or to ascertain that it does not exist, and generally to endeavor to solve the very important physical and geographical questions connected with this remarkable ice formation.

17. Owing to our very imperfect knowledge of the conditions which prevail in the Antarctic seas, we cannot

pronounce definitely whether it will be necessary for the ship to make her way out of the ice before the winter sets in or whether she should winter in the Antarctic regions. It is for you to decide on this important question after a careful examination of the local conditions.

18. If you should decide that the ship shall winter in the ice, the following instructions are to be observed :

a. Your efforts, as regards geographical exploration, should be directed, with the help of depots, to three objects, namely, an advance into the western mountains, an advance to the south, and the exploration of the volcanic region.

b. The director and his staff shall be allowed all facilities for the prosecution of their researches.

c. In carrying out *a* and *b* due regard is to be had to the safety and requirements of the expedition as a whole.

d. You have been provided by Sir Leopold McClintock and by Dr. Nansen with complete details respecting sledge-work both by men and dogs, and you have yourself superintended every item of the preparations connected with food, clothing, and equipment. You will be guided by the information and knowledge thus acquired.

e. Lieutenant Armitage, R. N. R., who has been appointed second in command and navigator to the expedition, has had experience in the work of taking astronomical, magnetic, and meteorological observations during three Polar winters. He has also acquired experience in sledge-traveling and in the driving and management of dogs. You will, no doubt, find his knowledge and experience of great use.

f. Early in 1903 your ship should be free from the ice of the winter quarters, and you will devote to further exploration by sea so much of the navigable season as will certainly leave time for the ship to return to the north of the pack ice. Having recruited at your base

station, you will then proceed with your magnetic survey across the Pacific and return to this country.

19. If, on the other hand, you should decide not to winter, you will bear in mind that it is most important to maintain scientific observations on land throughout the winter, and therefore if you are able, in consultation with the director, to find a suitable place for a landing party between Cape Johnson and Cape Crozier, and decide that such a party can be landed and left without undue risk, the following instructions will apply :

a. You will land a party under the command of such person as you may appoint. Such party shall include the director, the physicist, and one of the surgeons, and such other persons as you may consider desirable ; but no person is to be left without his consent in writing, which you will be careful to obtain and preserve.

b. You will give every practicable assistance in establishing on land this party, which you will supply with all available requisites, including a dwelling hut, an observer's hut, three years' provisions, stores, fuel, sledges, and dogs.

c. No landing party is to be established on any other part of the coast than that between Cape Johnson and Cape Crozier, as it is above all things essential that in case of accident the approximate position of the party should be known.

d. Before it is so late as to endanger the freedom of your ship, you will proceed north of the pack and carry out magnetic observations with sounding and dredging over as many degrees of longitude (and as far south) as possible, so long as the season and your coal permit, and then return to your base station, whence you will telegraph your arrival and await further instructions.

20. You are to do your best to let us have and to leave where you can state-

ments of your intentions with regard to the places where you will deposit records, and the course you will adopt, as well as particulars of your arrangements for the possible need of retreat, so that in case of accident to the ship or detention we shall be able to use our best endeavors to carry out your wishes in this respect.

21. In an enterprise of this nature much must be left to the discretion and judgment of the commanding officer, and we fully confide in your combined energy and prudence for the successful issue of a voyage which will command the attention of all persons interested in navigation and science throughout the civilized world. At the same time, we desire you constantly to bear in mind our anxiety for the health, comfort, and safety of all entrusted to your care.

22. While employed on this service you are to take every opportunity of acquainting us with your progress and your requirements.

23. In the unfortunate event of any fatal accident happening to yourself or of your inability, from sickness or any other cause, to carry out these instructions, the command of the ship and of the expedition will devolve on Lieutenant Armitage, who is hereby directed to assume command and to execute such part of these instructions as have not been already carried out at the time of his assuming command. In the event of a similar accident to Lieutenant Armitage, the command is to devolve on the executive officer next in seniority on the articles, and so on in succession.

24. All collections and all logs (except the official log), journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two societies, to be disposed of as may be decided by them. Before the final return of the expedition you are to demand from the naval staff all such data, which are to be sealed up and delivered to the two presidents or dealt

with as they may direct. The director of the civilian scientific staff will be similarly responsible for the journals, collections, etc., of the officers under his control. You and the other members of the expedition will not be at liberty without our consent to make any communication to the press on matters relating to the affairs of the expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the secretary of the National Antarctic expedition, London.

25. The *Discovery* is not one of His Majesty's ships, but is registered under the Merchant Shipping Act, 1894, and is governed by it. Copies of this act will be supplied to you. You will see that the officers and crew sign the ship's articles as required by the act. The scientific staff will not sign articles, but are to be treated as cabin passengers. You must be careful not to take more than 12 persons as passengers.

26. The vessel has been covered by insurance, and, in the event of her sustaining any damage during the voyage, to recover the claim from the underwriters it will be necessary for you to call in the services of Lloyd's agent, or, in his absence, an independent surveyor, at the first port of call, in order that the damage may be surveyed before repairs are effected. His survey report, together with the accounts for repairs and supporting vouchers, should be sent to us by first mail, together with a certified extract from the official log reporting the casualty.

In the event of damage occurring after you have left civilized regions precise particulars should be entered in the log, and the damage should be surveyed and repaired as soon as you return to a port where Lloyd's agent or other surveyor is available.

27. The *Discovery* is the first ship that has ever been built expressly for scien-

tific purposes in these kingdoms. It is an honor to receive the command of her; but we are impressed with the difficulty of the enterprise which has been entrusted to you and with the serious character of your responsibilities. The expedition is an undertaking of national importance, and science cannot fail to benefit from the efforts of those engaged in it. You may rely upon our support on all occasions, and we feel assured that all on board the *Discovery* will do their utmost to further the objects of the expedition.

INSTRUCTIONS TO THE SCIENTIFIC DIRECTOR OF THE CIVILIAN SCIENTIFIC STAFF

1. The Royal Society and the Royal Geographical Society have approved your appointment as director of the civilian scientific staff of their Antarctic expedition.

2. A copy of the instructions to the commander of the expedition accompanies these instructions, which are supplemental to them. You will see from the instructions to the commander what the objects of the expedition are, and your position relatively to them.

3. You will direct the scientific work of the gentlemen who have been appointed to assist you.

4. The names of the gentlemen associated with you are as follows: (1) Mr. Hodgson, biologist; (2) Mr. Shackleton, physicist. The services of the two medical officers will be at your disposal for scientific work when not engaged on the work of their own department, namely, Dr. Koettlitz, botanist, and Dr. Wilson, zoölogist.

5. You will note that the commander of the expedition has been instructed to communicate freely with you on all matters connected with the scientific objects of the expedition, and, as far as possible, to meet your views and wishes in connection with them. The societies feel assured that you will coöperate and

act in concert with him, with a view, as far as possible, to secure the success of an enterprise which it is hoped will be attended with important results in the various branches of science which it is intended to investigate.

6. All collections, logs, journals, charts, drawings, photographs, observations, and scientific data will be the joint property of the two societies, to be disposed of as may be decided by them. Before the final return of the expedition you are to demand from the staff under your control all such data, which are to be sealed up and delivered to the two presidents or dealt with as they may direct. On the return of the expedition you will be expected to superintend the distribution of specimens to specialists approved of by the two councils or their representatives, and to edit the resulting reports. You will also be expected to contribute a report on the scientific results of the expedition for the official narrative. As it may be desirable during the progress of the voyage that some new scientific discovery should be at once made known in the interest of science, you will in such a case inform us of it by the earliest opportunity.

7. You and the other members of the expedition will not be at liberty, without our consent, to make any communication to the press on matters relating in any way to the affairs of the expedition, nor to publish independent narratives until six months after the issue of the official narrative. All communications are to be made to us, addressed to the care of the secretary of the National Antarctic expedition, London.

8. Should any vacancies in the scientific staff occur after the expedition has sailed from England, you may, with the concurrence of the commander, make such arrangements as you think desirable to fill the same, should no one have been appointed from England.

9. You and the members of the scien-

tific staff will be cabin passengers, joining the expedition at your own risk, and neither the owners nor the captain are to be responsible for any accident or misfortune which may happen to you.

You will obtain from each member a letter to this effect.

The instructions are signed by the presidents of the Royal Society and the Royal Geographical Society.

URBAN POPULATION OF UNITED STATES*

THE city population of the United States during the ten years ending with the last census increased by nearly 37 per cent, in actual numbers 7,642,817, while the increase in the total population of the country during the same period was not quite 21 per cent.

In 1900 there were 160 cities, 161 including Honolulu, having a population of over 25,000. Of this number nineteen cities contained 200,000 inhabitants or more, nineteen cities had between 100,000 and 200,000 inhabitants, forty cities had between 50,000 and 100,000, and eighty-three had between 25,000 and 50,000. A recent bulletin of the Census Bureau, prepared under the direction of William C. Hunt, gives some interesting facts and figures relative to growth of the city population in the United States.

In 1890 there were 124 cities which had a population of 25,000 or more, but of these cities Brooklyn and Long Island City now form a part of New York city, showing a net gain of thirty-nine cities in 1900, as compared with 1890. Of the 124 cities in 1890, sixteen had 200,000 inhabitants or more, twelve had between 100,000 and 200,000 inhabitants, thirty had between 50,000 and 100,000 inhabitants, and sixty-six had between 25,000 and 50,000.

In 1880 there were but twenty cities which contained more than 100,000 inhabitants, but in 1890 this number had increased to twenty-eight, and in 1900 to thirty-eight.

In 1900 there were seventy-eight cities of 50,000 inhabitants or more, as compared with fifty-eight in 1890 and thirty-five in 1880.

The nineteen cities of the first class comprise New York, which, with more than 3,000,000 inhabitants, properly stands by itself; two cities, Chicago and Philadelphia, each of which has a population in excess of a million; three cities, St. Louis, Boston, and Baltimore, which have a population of half a million each; five cities, Cleveland, Buffalo, San Francisco, Cincinnati, and Pittsburg, which have a population of between 300,000 and 400,000 each, and eight cities, New Orleans, Detroit, Milwaukee, Washington, Newark, Jersey City, Louisville, and Minneapolis, which have a population of between 200,000 and 300,000 each.

The following-named States and Territories in 1900 do not contain any city with a population of 25,000 or more: Arizona, Idaho, Indian Territory, Mississippi, Nevada, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Vermont, and Wyoming.

Of the whole number of cities having 25,000 inhabitants or more in 1900, 70 are found in the North Atlantic division, 49 in the north central division, 18 in the south central division, 12 in the western division, 11 in the South Atlantic division, and 1 in Hawaii. Massachusetts has the largest number of such cities, namely, 20, and is followed by Pennsylvania with 18 and New York with 12.

The most significant growth of cities

* Census Bulletin No. 70.

is that for the three cities in the State of Washington, namely, Seattle, Spokane, and Tacoma. These three cities combined had only 4,981 inhabitants in 1880, but their population had increased to 98,765 in 1890, and to 155,233 in 1900, the increase during the past decade being equivalent to 57.2 per cent.

Nebraska is the only State in which the combined population of the cities contained therein shows a decrease from 1890 to 1900.

There were in 1790 but six places having 8,000 inhabitants or more, containing in all but 131,472 persons, or only 3.4 per cent of the total population at that census. At the census of 1830 the proportion of the total population living in places of like size had been increased to 6.7 per cent, representing 864,509 persons living in 26 places out of a total population for the entire country of 12,856,020. At the census of 1850 there were 2,897,586 persons living in 85 places of upward of 8,000 inhabitants, equivalent to 12.5 per cent of the entire population, which comprised then 23,191,876 persons. In 1880 the proportion, as compared with 1850, had nearly doubled, there being, out of a total population of 50,155,783 at that census, 11,318,547 persons, or 22.6 per cent, living in 286 such places. During the succeeding decade there was a very large increase in urban population, so that at the census of 1890 very nearly 30 per cent of the population was found living in 447 cities or equivalent incorporations of 8,000 inhabitants or more, comprising, as before stated, 18,272,503 persons out of a total population of 62,622,250.

The proportion of urban population has increased during the past ten years at a less rapid rate, there being, according to the figures of the present census, not quite one-third (33.1 per cent) of the population now living in places of 8,000 inhabitants or more, exclusive of Alaska, Indian Territory, Indian reservations, Hawaii, and persons enumerated at stations abroad.

There has been a notable increase since 1890 in the proportion of urban population in the North Atlantic division of States, considered as a whole, and this statement is true, in a somewhat less degree, of the north central division; 58.6 per cent of the total population of the North Atlantic division and 30.6 per cent of that of the north central division in 1900 live in places of 8,000 inhabitants or more, as compared with 51.7 per cent for the former and 25.9 per cent for the latter division at the census of 1890.

In Rhode Island 81.2 per cent of the population in 1900 live in cities or towns of 8,000 inhabitants or more, while this element also constitutes 76 per cent of the population in Massachusetts, 68.5 per cent in New York, 61.2 per cent in New Jersey, and 53.2 per cent in Connecticut. These are the only States, aside from the District of Columbia, in which the proportion of urban population, measured on this basis, is greater than one-half of the total population in 1900, but in Pennsylvania, Delaware, Maryland, Illinois, and California there is between 40 and 50 per cent of the total population living in places of this size.

E. O. Hovey, associate curator of the American Museum of Natural History of New York, is at work in western South Dakota collecting Jurassic fossils for the museum.

Prince Henry of Orleans, who with Bonvalot traversed Tibet in 1890, died at Saigon, French Cochin China, on August 9. The prince had also traveled extensively in Campodia and Tonkin.

GEOGRAPHIC NOTES

THE BALLOON AS AN AID TO EXPLORATION

IT might not be inappropriate at the present time, in view of M. Santos Dumont's success in aerial navigation, to recall the argument of the famous American aeronaut Wise in favor of the use of balloons in exploration.

"If, for instance," writes Mr. Wise, in "A System of Aeronautics," 1850, "we take a balloon of limited size, about 18 feet in diameter each way, it will, when inflated with hydrogen gas, be capable of raising 160 pounds, independent of its own weight. Now, if this be so fastened to a man's body, as not to interfere with the free use of his arms and legs, he may then ballast himself so as to be a trifle heavier than the upward tendency of the balloon, which will be nearly in equilibrium." . . . "He may then bound against the earth with his feet so as to make at least a hundred yards at each bound.

"This the writer has often done, in the direction of a gentle wind, with the aid of his feet alone, after his balloon had descended to the earth; and, on one occasion, traversed a pine forest of several miles in extent, by bounding against the tops of the trees. Such a contrivance would be of inestimable value to exploring expeditions. Landings to otherwise inaccessible mountains; escapes from surrounding icebergs; explorations of volcanic craters; traversing vast swamps and morasses; walking over lakes and seas; bounding over isthmuses, straits, and promontories, or exploring the cloud-capped peaks of Chimborazo, could thus all be easily accomplished."

POPULATION OF CANADA

THE population of the Dominion of Canada is given by the recent census as 5,338,883, an increase of 505,644, or about 10½ per cent, during the last

ten years. The population of the provinces is as follows:

Provinces.	1891.	1901.
British Columbia.....	98,173	190,000
Manitoba.....	152,506	246,464
New Brunswick.....	321,263	331,093
Nova Scotia.....	450,396	459,116
Ontario.....	2,114,321	2,167,978
Prince Edward Island....	109,078	103,258
Quebec.....	1,488,535	1,620,974
Territories.....	66,799	145,000
Unorganized territories...	32,168	75,000

The population of the principal cities of Canada, by municipal boundaries, is as follows:

Cities.	1891.	1901.
Montreal.....	220,181	266,826
Toronto.....	181,220	207,971
Quebec.....	63,090	68,834
Ottawa.....	41,154	59,902
Hamilton.....	48,980	52,550
Winnipeg.....	25,639	42,336
Halifax.....	38,495	40,787
St. John.....	39,179	40,711
London.....	31,977	37,983
Victoria.....	16,841	20,821
Kingston.....	19,263	18,040
Vancouver.....	13,709	26,196
Brantford.....	12,753	16,631
Hull.....	11,264	13,988
Charlottetown.....	11,373	12,080
Valleyfield.....	5,515	11,055
Sherbrooke.....	10,097	11,765
Sydney.....	2,427	9,908
Moncton.....	5,165	9,026
Calgary.....	3,876	12,142
Brandon.....	3,778	5,738

A study of the population by families compared with 1891 is very interesting. In nearly every province the per cent of increase by families is considerably greater than the per cent of increase of the actual population.

Provinces.	1891.	1901.
British Columbia.....	20,718	30,000
Manitoba.....	31,786	48,590
New Brunswick.....	58,462	62,700
Nova Scotia.....	83,730	89,106
Ontario.....	414,796	451,839
Prince Edward Island.....	18,601	18,746
Quebec.....	271,991	303,301
Territories.....	14,415	29,500
Unorganized territories.....	32,168	75,000

The dwellings are as follows :

Provinces.	1891.	1901.
British Columbia.....	20,016	38,000
Manitoba.....	30,790	47,903
New Brunswick.....	54,718	58,227
Nova Scotia.....	79,102	85,032
Ontario.....	406,946	440,419
Prince Edward Island.....	18,389	18,530
Quebec.....	246,644	287,533
Territories.....	14,129	28,300

The returns for extreme northern portions of Quebec and Ontario and for the unorganized territories of Athabasca, Franklin, Keewatin, MacKenzie, Ungava, and Yukon have not been received.

COAL IN THE UNITED STATES

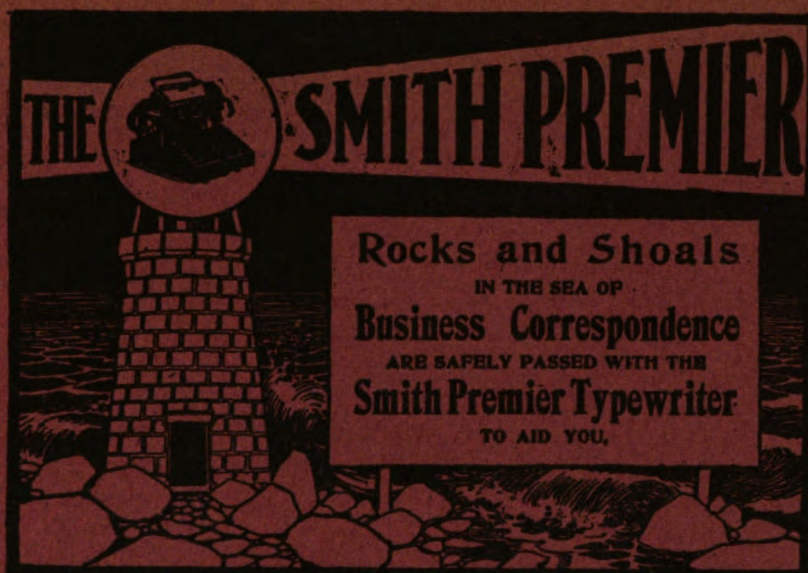
THE output of coal in the United States for 1900 for the second successive year surpassed the output of Great Britain during the same period. Mr. Edward W. Parker, statistician, of the U. S. Geological Survey, reports the total output in 1900 in the United States as 267,542,444 short tons, an increase over the preceding year of 13,802,452 tons, or a little more than 5 per cent. The output in Great Britain for the year was 15,000,000 short tons less. West Virginia showed the largest increase in tonnage, her output exceeding 21,000,000 tons for the first time. Ohio showed the next largest increase, and Alabama, Arkansas, the Indian Territory, Michigan, and Utah also made very notable gains. The output in Kansas increased by 600,000 tons, or 16 per cent, and that of Kentucky by 575,000 tons, or 12 per cent.

The following table, prepared by Mr. Parker, gives the production and value of coal (in short tons) in the different States in 1900:

	Production.	Value.
Alabama.....	8,393,385	\$9,745,722
Arkansas.....	1,441,345	1,653,818
California.....	171,708	523,231
Colorado.....	5,232,643	5,848,339
Georgia and North Carolina.....	333,291	370,022
Illinois.....	25,153,929	22,529,665

	Production.	Value.
Indiana.....	6,449,645	\$6,645,739
Indian Territory.....	1,918,572	2,782,838
Iowa.....	5,237,634	7,202,996
Kansas.....	4,453,107	5,368,642
Kentucky.....	5,181,917	4,730,698
Maryland.....	4,024,688	3,927,381
Michigan.....	849,455	1,259,683
Missouri.....	3,269,491	4,015,980
Montana.....	1,661,775	2,713,707
New Mexico.....	1,299,099	1,775,570
North Dakota.....	129,883	158,358
Ohio.....	19,105,408	19,403,362
Oregon.....	58,864	220,001
Pennsylvania:		
Anthracite.....	57,107,660	82,993,471
Bituminous.....	79,616,346	77,166,158
Tennessee.....	3,731,617	4,215,080
Texas.....	968,373	1,581,914
Utah.....	1,146,277	1,445,415
Virginia.....	2,137,007	1,757,525
Washington.....	2,474,093	4,700,068
West Virginia.....	21,980,430	17,698,734
Wyoming.....	4,014,602	5,457,953

Adolf Erik Nordenskjöld, the first and only explorer to accomplish the Northeast Passage, died at his home, in Stockholm, on Tuesday, August 13. Nordenskjöld was born 69 years ago at Helsingfors, the capital of Finland. He had but reached the age of manhood when he fell under the suspicion of the Russian authorities and was compelled to leave the country. He settled in Sweden and soon became interested in Arctic exploration. Nordenskjöld had already spent 20 years adding to the maps of Greenland, Spitzbergen, and the Kara Sea, which he was one of the first to penetrate, when he determined to reach Bering Strait by crawling around the headlands and islands of northern Asia. Without any hindrance he had arrived almost in sight of the strait when the tantalizing ice closed in before him, and for ten months his ship was held motionless. Then the ice mass opened and allowed the *Vega* to sail the few remaining miles to and through the strait and thus to complete the Northeast Passage (1879). He did a great deal to promote navigation along the north coast of Siberia and to lead commerce to the mouths of the great Siberian rivers—Obi, Yemsei, and Lena.



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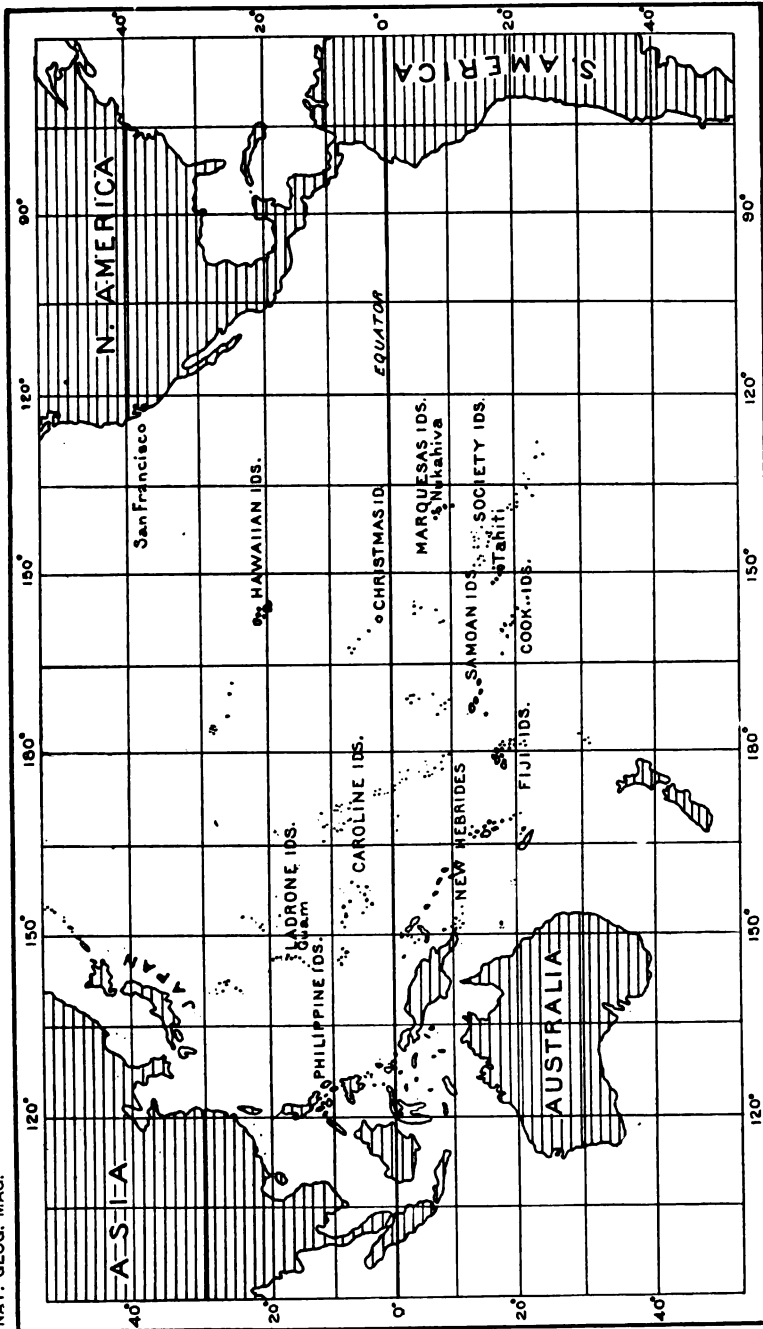
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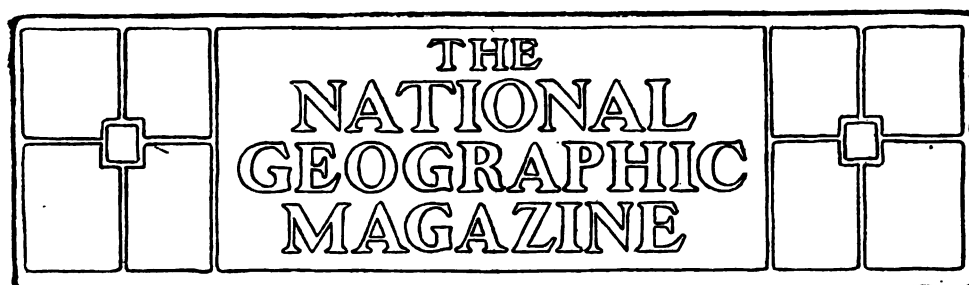
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Outline Map Showing Position of Tahiti in Mid Pacific



DIARY OF A VOYAGE FROM SAN FRANCISCO TO TAHITI AND RETURN, 1901

By S. P. LANGLEY

PREFACE

UNTIL lately Tahiti (Cook's Otaheite) has been reached from the United States only by a sailing schooner from San Francisco in a voyage of six or seven weeks. There has been an occasional steamer from New Zealand; and the French, who are in possession of the island, send a warship at intervals; but on the whole the islanders are in very much the same condition that they were a hundred years ago.

The French Government has just subsidized a vessel of the Oceanic Steamship Company, which is to make a trip to Tahiti once in every five weeks, the voyage lasting only about eleven days. On the occasion of the French National

Fête, on the 14th of July (1901), the company advertised a trip widely throughout the United States.

I was led to think that the occasion was one for seeing the native ways and customs of the islands before the innovations that would be introduced by the steamer communication in the future, and, expecting to have a companion, I had arranged to take the voyage. My companion failed me at the last moment, and I took the trip alone, commencing my diary with the departure from San Francisco. I have published it as written at the time, without modifying the style such diarial notes naturally take.

June 25.—In the morning of the 25th of June I went down to see the *Australia* at the dock. She is a long, narrow vessel, painted white, of 3,200 tons burden, with great piles of lumber on her main deck, and evidently both old and overloaded. I secured my passage with some misgiving.

June 26.—Going down to the boat at 9.30 a. m., I hear from more competent judges than myself the confirmation of my feeling that the boat is extremely overloaded. The depth to which she has sunk in the water and the lumber on the decks say this even to a landsman's eye; but when I get on board of

her, things in other respects look better. She has a prepossessing set of officers, and as the first-cabin passengers are only about forty in number, there will evidently be plenty of room. A considerable part of the passengers appear to be minor French officials, but there are also some Californians, who promise pleasant company, and it appears that many of the passengers are not going to stay, but are on a pleasure trip. We are told that we are to stop at the Marquesas Islands, the scene of Herman Melville's adventures in "Typee," there to take on 300 Marquesan savages, who are going to Tahiti to participate in the French fête on the 14th of July.

The vessel flies the French flag. We get under weigh very promptly at ten o'clock and pass through "the Golden Gate" into the Pacific, running for three or four hours directly down the coast and within a mile or so of it. A great black whale, a mile or two away, thrashing about and throwing up his tail, is an interesting object. The sea is not high, but comes freely onto the main deck, which is perhaps only six feet out of water! We are accompanied by an increasing number of "goonies," a dark brown bird, spreading five or six feet of long narrow wings, the notable character of which is that they are at all times, in sailing flight, carried *below* the body. It flapped and then sailed with extreme swiftness, constantly turning till the line joining the wings was almost vertical, and in this position the tip of the lower wing appeared to just graze the water, but I never saw it pick up anything in this flight.

The table is good for a vessel of the kind. There are some pleasant passengers, and there is an electric light and ice-making plant, so that the vessel is better than her looks.

June 27.—It is cold enough to make semi-winter clothing comfortable, and I turned in at 9.30 o'clock and slept for ten hours in spite of the occasional seas

which broke over the main deck in solid water, once striking against my state-room window on the upper deck (starboard side) with a bang, as if they would stave it in. Our course was south, and even south by east. Vessel rolls less. It is still pleasantly cool; bright sun.

June 28.—Slightly overcast and misty; not as cool, but not hot; read and conversed with fellow-passengers.

June 29.—Today, about noon, we enter the tropics. The run has been 316 miles. The days are still cool; the weather is just right. I sit forward on the broad upper deck, beneath the awning, with four or five pleasant people; read, talk, sleep, and am content. Most of the passengers are on the port side of the main deck below, the vessel rocks lullingly, and there is an occasional mist. The last "goony" left us today.

"The Injian Ocean sets an' smiles,
So sof', so bright, so bloomin' blue;
There aren't a wave for miles an' miles,
Excep' the jiggle from the screw."

June 30.—Sunday; no observance. Day slightly warmer, but pleasant. We are about half way to the Marquesas, and no sight of a sail nor any sign of man, probably, until we get to them. One does not like to think of fire or an accident happening *here*.

The captain has an instrument, which he calls a *Pelorus*, for getting the true course of the vessel by the sun—something like a marine solar compass.

Got a list of Tahitian words from a lady passenger, Mrs. Hart, the wife of the Captain Hart mentioned in Stevenson's South Seas. Stevenson says that in 1878 (when he wrote) cannibalism was not yet extinct in the Marquesas, whose inhabitants he calls the most savage of the South Seas. Mrs. Hart confirms Stevenson's account of the massacre on her husband's plantation, and his account in general. He mentions that the natives were prevented by the French Government from carrying away whole the bodies of the slain

to eat, but, finding a lot of empty match-boxes, they cut up one body into small pieces and sent it as tid-bits in these little boxes over the island!

July 1.—In the "Doldrums;" much warmer. A white gull with a long feather in its tail (the "tropic bird") and sundry flapping and diving birds accompany the vessel.

July 2.—Frequent showers; warm.

July 3.—Vessel rolls a great deal, many sick, but I am exempt. Cool wind and very pleasant.

July 4.—Pass the Equator at 7 a. m. ship's time: Celebration by the Americans—speeches, one by Judge K., brief and appropriate. In afternoon, games, "chalking the deck," mock prizes, etc.

July 5.—A little warmer. We are to see Nukahiva tomorrow morning.

THE MARQUESAS

July 6.—Awoke at 5.30, dressed, and went on deck. It was a quarter of an hour before sunrise, but only the eastern sky was bright. The boat's engine had stopped, and the bow was pointed to a great mass of rock of jagged outline, yet covered with green nearly to the summit, all laying to the north of us. The sun below the horizon seemed to radiate greenish-blue fan-shaped streamers, the sky between and below which shifted rapidly between these and primrose tints, or what was not primrose, but some nameless shade of delicate quickening color, that we all looked at in delight. Just before the sun arose the bright light struck between the awning and the deck and lit up the groups of passengers on a dark background with an effect like that of the lime-light at a play. It was perfect, unless it might have been charged with being a bit theatrical!

The vessel anchored half a mile from the shore. The harbor of Tyowai is on the south of the island. We waited two or more hours, apparently until the French official in charge had finished his breakfast, and only at 9 o'clock we

went ashore. I believe A. was the only one who remained on board. He prophesied intolerable sand flies and heat for us, but we found neither.

The old queen, who was the last authentic relic of the ancient sovereignty, had died 24 days before, so there was nothing to see but the mission. The nuns gave us something they called lemonade—a mildly fermented sort of drink.

The shore was covered with cocoanut, breadfruit, and orange trees. There were no native houses, only 30 to 40 European-built wooden ones, and everything, except perhaps the mission, had an air of shabby decay. The island's population is said to have dwindled from 18,000 to 350. The missionaries, I understand, whether Catholic or Protestant, feel obliged to admit that as a rule they have been able to change the natives' lives in external form only. Clothing is worn and hymns are sung instead of savage songs; marriage is nominal, and underneath this everything is absolutely as it was in pagan times.

A little outriggered boat, with one man, had come out with a few bananas and "vees," a sort of small mango, pear-shaped, with a thin banana-like skin and a very juicy interior, having a mild pineapple taste. But this was the only thing good save the cocoanuts, of whose water we drank abundantly. We had been expected for long; our arrival was what might be called the great event of their year, but no one paid any attention to it. No one got anything ready to sell or came off to see the ship, except the man in the little boat, until just before we were leaving.

The natives wear European dress, when they wear anything, the women being in very gaudy French calicoes. The men, especially the elder, are tattooed, the effect being that of uniform bands of olive-greenish color across the face, rather than any design. One old lady, however, had her left hand and wrist elaborately tattooed, and I was told



Gathering Cocoanuts

that it was the hand with which she ate "poe." A boy "walked" up a tree and knocked down half a dozen coconuts, the milk of one of which I drank. I have tried to get some breadfruit cooked and some fresh fish; so far unsuccessfully. I have returned to lunch and am writing this on the deck, not meaning to return to the shore.

Four large boats are coming round the eastern point, sounding conch-shells and beating drums. They are from a neighboring valley and come, to the number of fifty or more natives, to execute a dance for our party, which I am not going on shore again to see. The 300 natives whom it was advertised the ship would take to Papeete have not appeared. We are told that they had made great preparations for going, but that the governor had changed his mind.

And Typee! The proprietor of the Typee Valley, Mr. G., is on board. He describes it as having two or three families living on it and some wild cattle, as containing two or three square miles, and as being five or six miles long. It must be much as it was in Melville's time, but without the inhabitants. The path to it, leading over the mountains, is visible from the ship. It is a slow ride, two hours long, or about six miles from the harbor, although Melville wandered for days in getting to it. It is described as having the most considerable stream of the island running through it (but without the little lake Melville mentioned) and as being lined with ancient "Ti's."

The mouth of the bay where the Typee Valley enters the ocean and where Melville escaped, is visible from the ship, eight miles away, and the Happar Valley must be between us and it. So near—and we sail at 4!

Got, with Mr. K. (a merchant of Papeete and a passenger), a basket of beautiful fresh fish, alive, of varied colors—some pure crimson, some striped with

green, etc. Mr. K. sent a man to get them, or we should have had none, the natives being too lazy to catch any.

We took on four horses which were swum out to the ship. It was curious to see the naked natives diving under the kicking beasts to attach the hoisting gear. We took on two or three Frenchmen and as many natives (instead of the 300!) and sailed at 5 o'clock.

July 7.—Nothing to record.

July 8.—After a somewhat rough night, a beautiful morning. The vessel (at 8) is passing an "atoll" some 30 miles long and, I suppose, 8 or 10 broad from rim to rim, the low beach being covered with trees, but a few of which are cocoa-palms. They say that the natives of these atolls have all the pearl-fishing in their own hands, the French government not allowing the competition of diving machines. The great gain is not in the pearls, but in the shells, which bring a hundred times as much profit, on the whole, being very large and worth in Tahiti about 90 cents in American money per kilo. They sell in London for £300 sterling the ton, so that for once the natives get a fair share of the profit, some of them making, in the best season, 30 or 40 Chile dollars (the Chile dollar is as large as our silver dollar, but passes for only 40 cents) a day at the opening of the fishing.

The greatest depth an expert diver can go is about 70 feet, and the extreme time he can stay under water is said to be a little over two minutes.

We are through with the dangers of the night, and are enjoying the prospect of landing tomorrow morning.

TAHITI

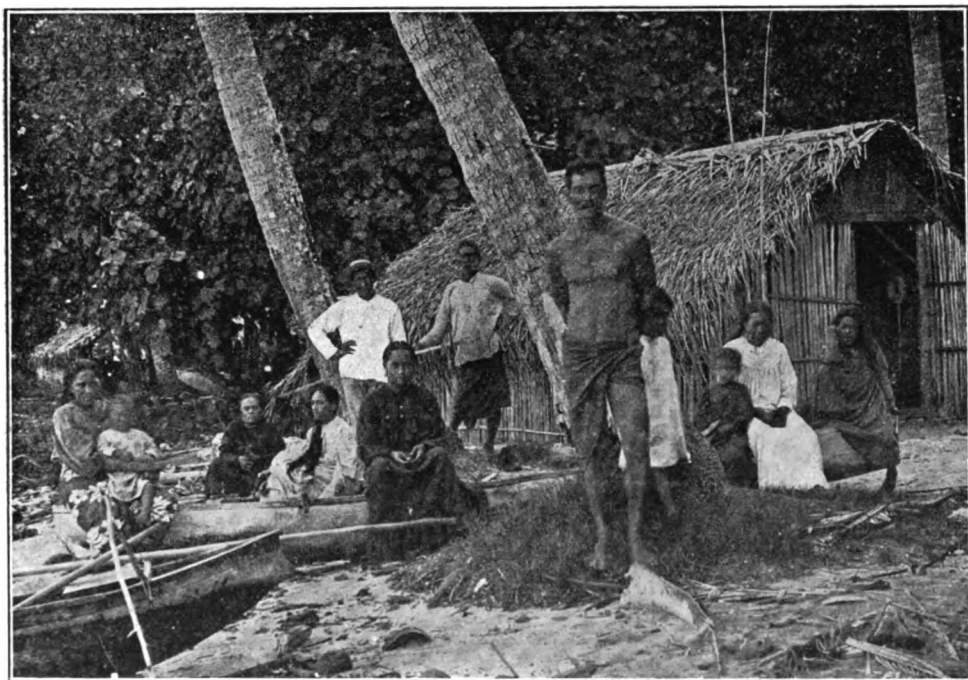
July 9.—We arrived off Tahiti early in the morning. It is a pile of mountains clothed with green to the summits, more than 7,000 feet high, with a narrow strip of low land between their feet and the sea, in which narrow space nearly

couriers around the island, both ways, to announce our coming to the chiefs who are to provide for us.

We pass through sugar plantations, and go by Mr. K.'s country place. On his lawn, between his house and the Pacific, are two old sacrificial stones. He says he is sure of finding plenty of human bones there when he uncovers the site. We go on by a delightful shady road close by the sea, till, at 12.30, we stop at Papenoo for a native breakfast. The principal dishes are (1) breadfruit cooked (baked) in leaves. It cuts like soft, very fine cheese, and I can hardly define the taste, but it is mildly pleasant. (2) Young pig, fed exclusively on cocoanut. It tastes half cocoanut, half pig! It is eaten with a sauce of sea-water, lime, and cocoanut juice. (3) Fish. (4) Oranges, cocoanuts, and other fruits. (N. B.—Cocoanut water and Bordeaux mix very well.)

The pigs, mostly little black creatures, appear to have been left by the Spaniards 300 years ago, and to be the only animal known to the island, and the only quadruped known to the older natives. Pig ("pua"), then, has become the generic name for animals; thus, a horse is *pua horo*, "the pig that runs over the ground," man (as an edible) is *long pig*.

The native women sing "himinies" with some very striking effects. The voices have something plangent and metallic in them, yet are melodious and in harmony. In the first song, at the end of each verse, all stopped suddenly, giving the effect of the "couac" of the opera singer. In all the verses there was an undertone beneath the song. This undertone continued alone for a few seconds at the end of each verse, after the superposed song was finished, and died out separately and slowly, like



Robinson Crusoe Hut

the drone of some great bagpipe. The natives gave names to each of us, mine being "A-to-hi," which means "qui a les lauriers."

The place where we breakfasted (at Papenoo) was a semi-European house belonging to the chief of the district. It was a large one-story shed-like building. We left at about 2 o'clock, and traversed a still more lovely embowered road, with the sea dashing on the rocks within a rod much of the way. The land and the rocks were covered with verdure, this green meeting the open ocean without any intervening beach. We forded stream after stream, until my jaded little rats of horses gave out in the middle of each and had to be helped on.

I had taken the lead, so that the procession could not get on without helping me forward to clear its own way. The ride was prolonged until the anticipated two hours became four; the fords grew worse and worse, and I, for one, was well tired when, just after six o'clock, and in the twilight, we arrived at another chief's, who had a large shed of three rooms, with the floor covered with beds. Most of the houses, however, were "Robinson Crusoe" huts, neatly built of upright bamboo. The natives are wilder than those near Papeete. The men are often naked, except for a loin-cloak of gaudy calico, no dress of native cloth (tappa) being, as a rule, worn by either sex.

We supped much as we breakfasted, except that I was instructed in the proper way of eating "Poe," the clinging plastic mess of starch-like consistency which so clung to Melville's fingers in Typee. The secret is simple—imitate the native, who puts his fingers in water first, then in the "Poe," and then sucks them dry. I chose to sleep out of doors on a mattress in the wagon, amid the cocoa palms, the passing forms of the natives, and the lights from the cooking fires. The novelty of the situation kept me awake a good deal. The

nearby surf sounded in my ears all night, and the sea breeze was so cool that I drew my rubber overcoat over the coverlet for warmth.

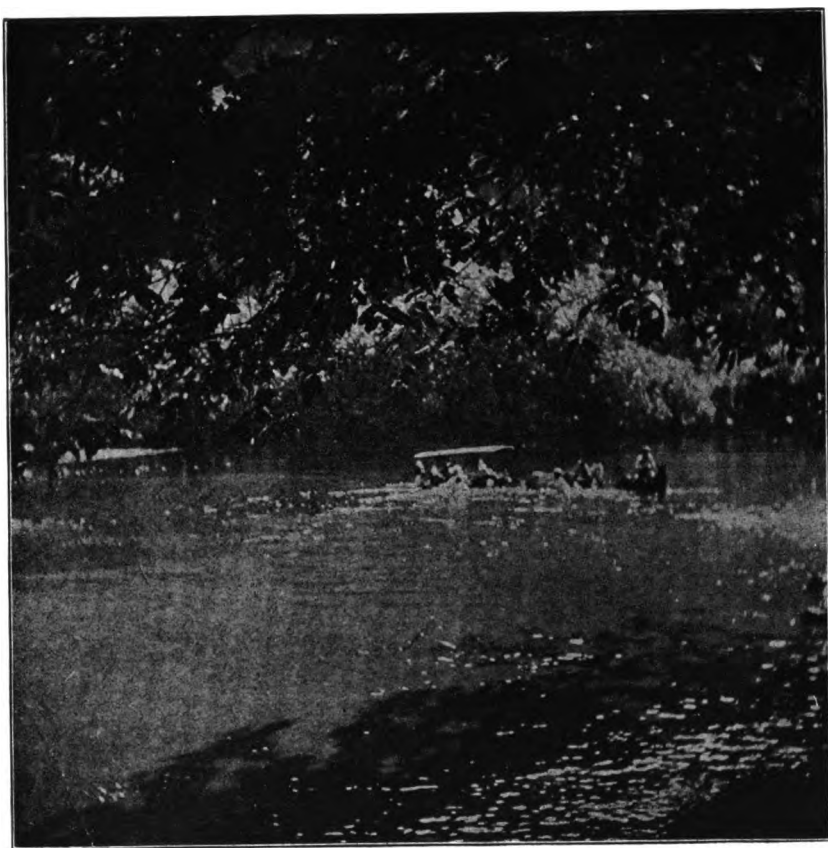
July 11.—I awoke with the noise of the natives in the early morning twilight, and went down to the beach. This was covered with rough stones and shell heaps, which made walking difficult; but I got into the water and let the Pacific roll over me, and going back just as the sun arose, ate one of the oranges from the trees about me like a simple savage!

After breakfast we moved on, over roads and through rivers which grew increasingly difficult for about ten miles. This is the wild part of the island. The road grew in places too narrow to let a wagon pass quite in safety between the cliff on the right and the sea, and finally we came to a river which was five feet deep opposite the place where we entered it.

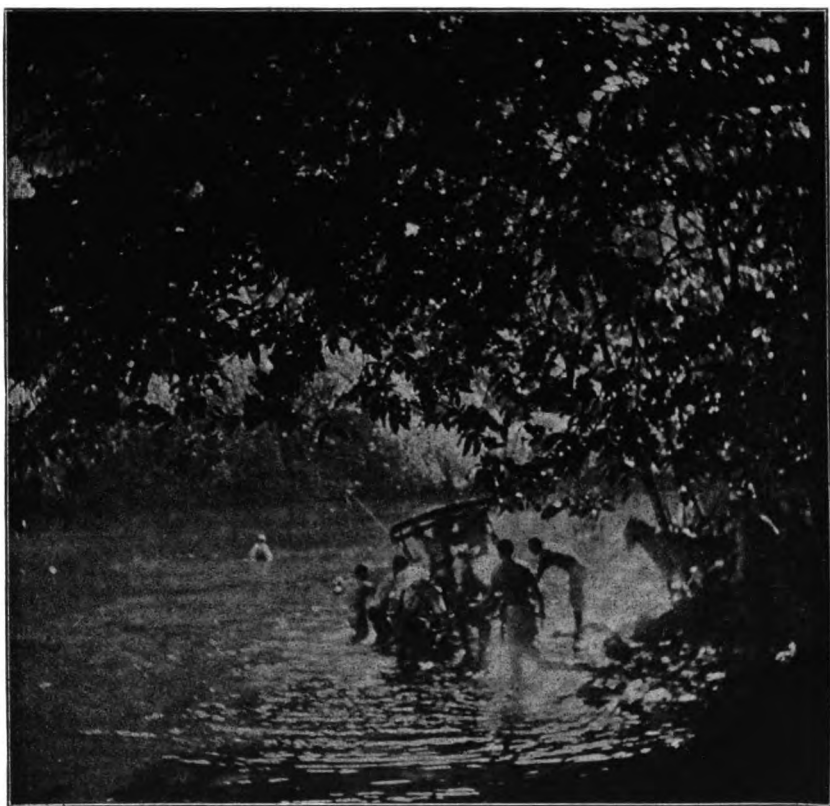
Turning down the river we drove in it to a ford where the water only just covered the floor of the wagon, and then turned up the stream again to where the landing was to be made, and here was the tug, to get over the fallen trees which encumbered the stream, and up the steep bank. The horses struggled, the natives filled the water with their heads and brown bodies, tugging at their horses' heads and lifting the wheels; some of the wagons filled, and some of the ladies were carried ashore on the backs of the islanders. We all got safe ashore, but it was lively while it lasted.

When we got to "the neck" the main party went on and I turned back to go down the civilized side of the island, over bridges and a good road to Tati's.* I got to Chief Tati Salmon's house about 2.30, where I was

* Chief Tati Salmon, the head of one of the oldest families and most considerable chiefs of the island, is so public a character that I need hardly apologize for mentioning his name and his hospitality here.



Crossing a Ford



Landing

warmly welcomed. I lay down and slept till near dinner time. Then I dined in state on the portico with Tati and his two sons. Our dinner was of soup, fish, dressed in native style, with cocoanuts, shrimps, and I forget what else.

The manner of these sons was very good, and to their father it was most respectful. I noticed a pretty cover on a table, which Tati said was a chief's mat. He offered to get one for me.

Tati, whom I had met in Washington, is the son of a native mother and a white father, and his family, a very ancient one, is still one of the most prominent, as he is one of the best educated and most intelligent, of the islanders. He mentioned to me that the chiefs were much at war in his great-grandfather's time, and that the object being to get the heads of their enemies, these were cut off and buried by the relatives of the dead in some secret place. Tati said also that the heads of some of his own family were buried in a place in the mountains, whose position he only approximately knew, the secret of the exact locality being kept by some old member of the clan. I have heard from others that his great-grandfather had large ideas of housekeeping. There is on the island a pitcher plant holding two or three tablespoonfuls of water; and, according to tradition, the old chief occasionally had a thousand men or so marched up in the morning, each with a pitcher plant stuck in the right ear, and the emptied contents formed the great man's bath.

After dinner I opened a topic which proved interesting to us all, the "supernatural" of the island. We talked for two hours, and I heard of the "fire-walking." One of Tati's sons said that he, at a fire-walk given in Tahiti three years before, having on shoes, had followed the barefooted priest over the "red-hot" stones, and that his shoes were not burned in the least.

July 12.—This morning I started at 8.30 and drove to Papeete, stopping for a bath in a stream, and getting in at about 2; breakfasted at the execrable restaurant, went to the ship, and then came to Apouhara Salmon's, a son of Tati's, where a room had been procured for me. Here I spent the afternoon. Just opposite is a large open space where the natives congregate with drums and sing "himinies" in preparation for the fête, and the place is not silent! Apouhara had gone out in the morning to meet me, but missed me on the way. I saw his wife, who is the daughter of the queen of a neighboring island, and Miss Salmon, Tati's sister, a very intelligent and agreeable lady.

July 13.—Drove out alone this morning to the Fatoua stream, described in Loti's "Rarahu"* as the bathing place. The pools he mentions are gone, I am told, but I drove up the side road along the bank of the stream for at least two miles, and came to a long, deep pool, shaded by trees and high hills. It is about 200 feet long and over head in the middle. The water is just cool enough, an ideal bath. As we rode back, I got some fresh cocoanuts from the trees, and drank all the water from one of them, eating part of the snowy cup. Oh, the pleasant memory!

I came back to Apouhara's, when I met Tati's son, who had taken part in the former fire-walking ceremony. I asked him to breakfast with me at the "Hotel du Louvre," which he did. There I saw a copy of the *Wide World* of June 1, containing an illustrated account of the recent fire-walking ceremony in Honolulu, conducted by the old native priest, Papa-Ita, a man of about sixty years of age, who is in town, and to whom young Tati introduced me. He is not the high priest (who lives in one of the Windward Islands), but a disciple, and he says he will give an ex-

* Pierre Loti, "Rarahu," 1880, reprinted 1882 under the title "Le Mariage de Loti."



Cook Island Chief



The Road to Point Venus

hibition here on Wednesday. I offered to pay for the wood for the fire, if necessary. The old man says he could teach the art in about a month. It consists, as I understood, in mystic rites, but there is no physical anointing. The prophet said he was going to pray for the next two or three days, and I sent him to his home in my carriage.

I went on board the steamer and told the captain, the ship's doctor, and U. S. Consul Doty of the prospective exhibition. Apouhara says that when Papa-Ita was here in 1897, any number of the people (15 or 20) followed the priest through the fire. When all are through some one calls, "All out," and the priest turns around and marches back again. If he turns and looks back before all are out, those still there will be burned!

Arranged with a French livery-stable keeper for a horse and carriage tomorrow.

July 14.—A wretched horse and carriage came, and I went to the Fatoua Pool and had another delicious bath. Came in and went to the ship, where I saw Mr. K., and spoke to him about the fire-walk. He attributes the "miracle" to the natives' horny-soled feet, but does not explain how tender feet of Europeans are not burned.

Paid extravagant bill at the wretched "Hotel du Louvre," and arranged to take subsequent meals on ship. Mr. K. promises to get me a two-horse team, and to send "Frank" around today at 1 o'clock, if he can find him, but he has not come. (Today is the French 4th of July and the occasion of the government fêtes to which the whole island has come.)

July 15.—Went out to the public dancing and singing, in competition for prizes offered by the government. It takes place in the square before the government house, and everybody is there, either performing or looking on. Almost the whole population of the island has come.

The chief interest among the islanders seems to lie in the competition of singing "himinies," and next to that, in the dancing, which is pantomimic as much as regular. As a public show, most of the native dances are unrepresentable, so that, I have understood, the authorities have had some difficulty in finding a dance which will do for such an occasion. Savages are here from the neighboring islands, a fine-looking chief from Cook island taking a part, and a woman from the same island gave a little of the presentable part of the "Hoola Hoola." Her body

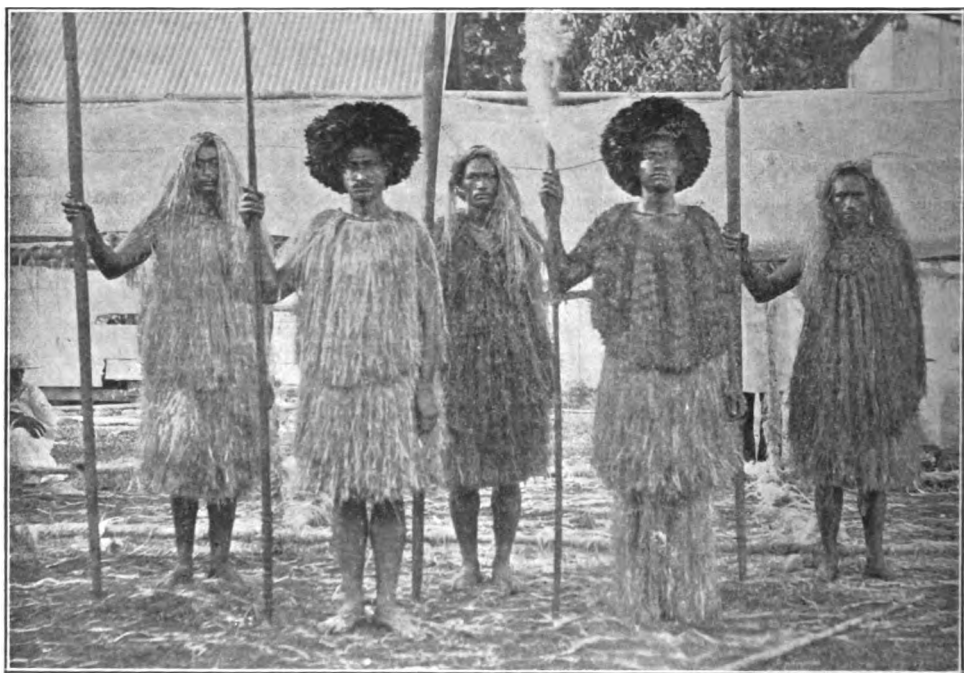
would be quivering like a jelly, and suddenly grow rigid as a statue—a notably odd effect.

In the afternoon there were regattas, the most interesting one being the rowing of one of the ancient double war canoes, or a modern duplication of it. There were 42 rowers, or rather paddlers, and they got up a "spurt" of speed which I estimated at about seven miles an hour. On this afternoon we sat on the deck and watched the wonderful sunset behind the fantastic peaks of Mourea. It would have been a time to quote Byron—

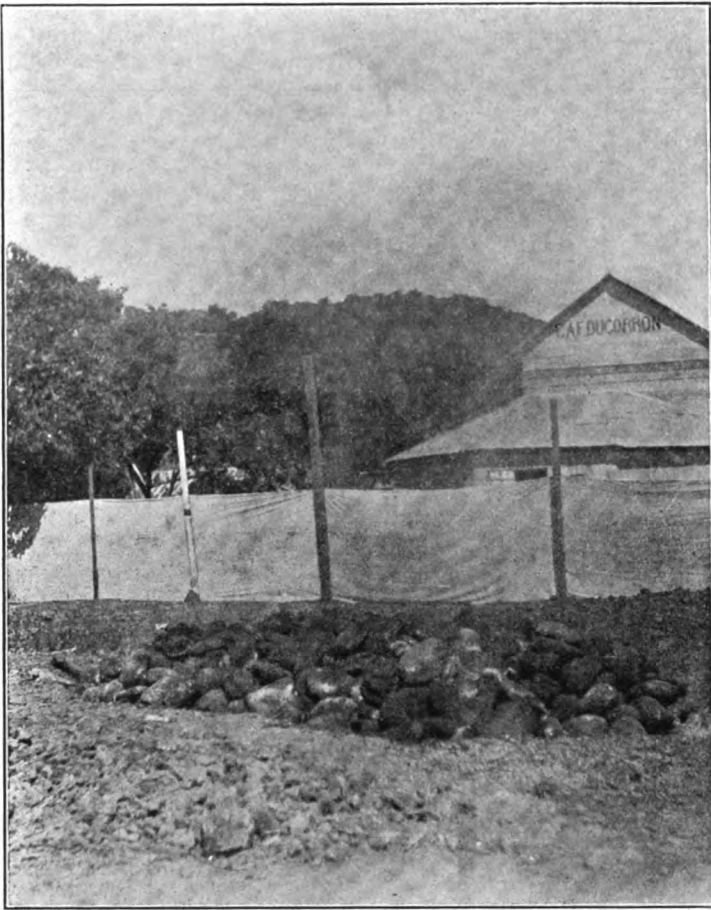
"Slow sinks more lovely ere its course be run
Along Morea's hills the setting sun."

only that the tropic sun does not descend slowly.

Frank, my driver, came at 1 o'clock with the old carriage and one horse. I drove Mrs. K. out to Point Venus,



Cook Islanders



The Pile of Stones Ready for the Fire Walk

and saw Cook's "meridian" stone. Frank says his own family and their ancestors have always lived near here, and that their traditions say that Cook's vessel was first seen by the natives from this point, and that he landed here. In the evening the whole Apouhara family went out, leaving me to keep house.

July 16.—More "himinies" in morning. In one very good dance by the Cook islanders over thirty persons take part. They sit down in three rows, representing rowers in a canoe, while

two scull and steer. They have paddles, and paddle to the sound of drums. A lookout man sweeps the horizon till he sees a big fish, and the canoe rows for him. One of the steerers sharpens a harpoon and passes it forward, and the fish (a man dressed in red) is harpooned. There is a tremendous time in pulling him in; he runs around and entangles the line among the bystanders, and finally he gets a second harpoon in him, is hauled on board, and (in pantomime) cut up with an ax, dismembered,

and eaten by the crew. Everybody is in motion, but it is rather a pantomime than a dance.

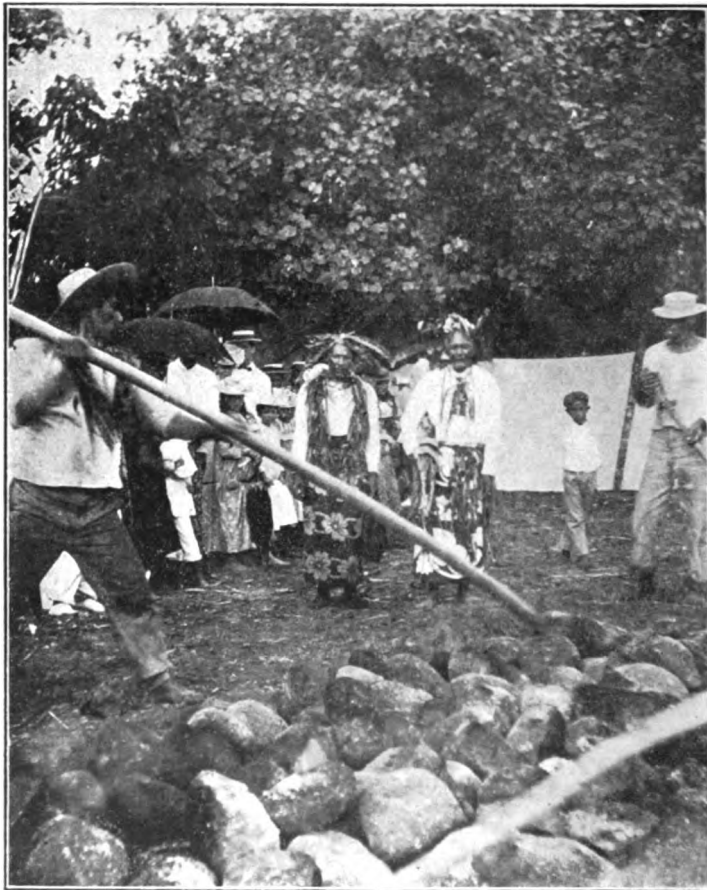
I went and had another glorious bath in the Fatoua Pool and came back in time for lunch.

THE FIRE WALK

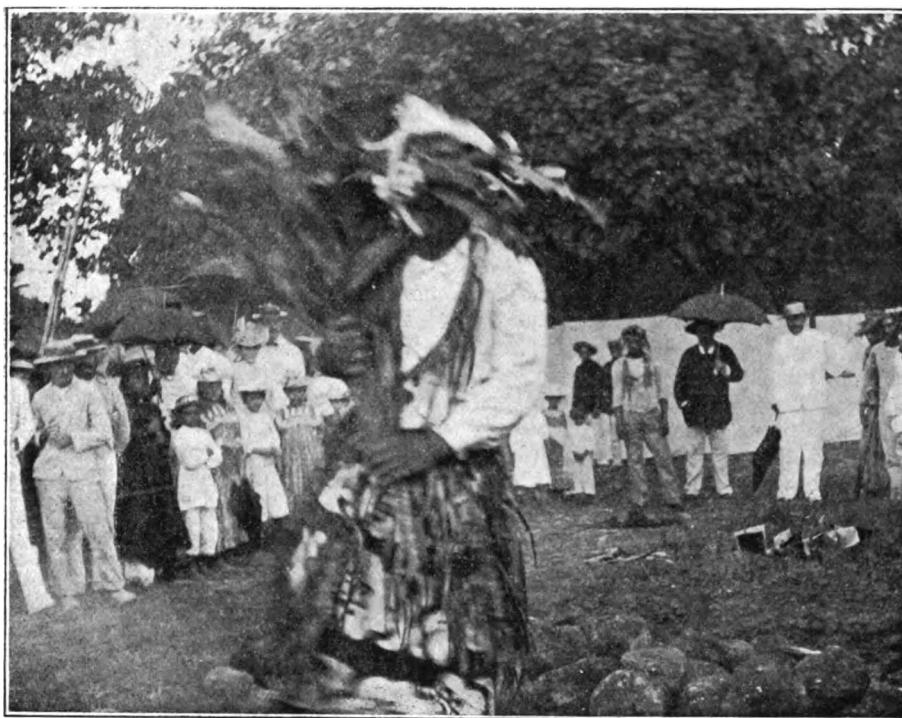
In the afternoon I went over to see preparations for the fire-walking. Within a hundred yards of the ship a shallow pit is dug (not apparently oriented to any point of the compass), about

9 feet by 20 feet by 18 inches deep. This is to be filled with firewood, and the stones heaped on the wood. These are smooth, water-worn, volcanic stones of varying size, but all rather large and weighing, at a guess, from 15 to 50 pounds. The number of the stones was about 200, and their average length about 15 inches.

Old Papa-Ita says that a woman who lived there long ago and who died and became a devil (or goddess) is the one to whom he prays and by whose meditation he passes unhurt through the fire.



"The aids began to turn the stones over with long green poles, which burned at the ends."



Papa-Ita, . . . with a large bunch of Ti leaves, . . . began to walk through the middle rather hurriedly

I have spoken to several respectable natives who separately walked through it after him three years ago here, who all agree that they felt little heat on their feet, but a good deal on their heads, their ears, and their hands.

July 17.—This morning arranged to pay \$6.30 (Chile) for five dozen fish, which were delivered early and put on ice; then went with Mrs. K. and bought the best shawl to be obtained in town for Mrs. Apouhara; paid for the chief's mat and other things which Tati had ordered for me, and then left my lodgings for the ship. I bathed for the last time in the Fatoua Pool; called on the governor and left my card and Ambassador Cambon's letter, getting an answer from the governor promptly, with an invita-

tion to call at 4 o'clock, which I was obliged to decline on account of the fire-walk at that hour.

In preparation for the fire ceremony, I took a tin ship's measure full of fresh water, which held very nearly 5 quarts and, by weight, 9.2 pounds. The empty tin weighed 1.1 pound. This is to be used in half-filling, with three or four measures, a large wooden bucket or tub with fresh water, into which one of the smaller hot stones from the center of the fire is to be put after the ceremony.

I am told that the fire was lighted at a little after 12. I arrived, with Captain Lawson, Dr. McNulty, Chief Engineer Richardson, and two assistants. The wooden bucket, containing $3\frac{1}{2}$ im-

perial gallons of fresh water at a temperature of 20 Reamur (77° F.) was provided, together with iron rakes from the engineer's room. The firewood was scarcely sufficient for a good heating; the stones in the center and beneath were, however, undoubtedly "red-hot." The outer enclosure, surrounded by canvas walls, was about 120 feet by 60 feet.

Mr. Ducarron, the U. S. Deputy Consul, says that Papa-Ita tried to carry on his exhibition in another island at the base of a hill composed of hard lime-stones, from which he exclusively used stone. (This was in Raiatea).

The fire there, I am told, invariably burned for 4 or 5 days before, and the stones became coated with lime. I learn that on one occasion, the French authorities having forbidden him to perform in his usual place, he made the "oven" of other stones, heating them for 36 hours. On attempting to cross, he walked only part of the way and ran the rest. His two disciples and a woman also ran across, and the woman's feet were so badly burned that she was laid up for a week. The prophet and his disciples declined to have their feet examined, and cleared out of sight. For corroboration, Mr. Ducarron says I may refer to M. Rousselot (address, Ministère des Colonies, Paris).

NOTES TAKEN ON THE SPOT WHILE THE PERFORMANCE WENT ON

At 4.40, when the priest came in, the stones on the side of the pile would bear to be touched by the hand.

The aids began to turn the stones over with long green poles which burned at the ends. The upper stones were none of them red-hot on top; the lower ones, two layers deep, however, could be seen to glow between the others, but they were only near red-hot in the center.

The old priest, Papa-Ita, beat the near stones with a large bunch of Ti

leaves three times, and then began to walk through the middle rather hurriedly, followed by two acolytes, who appeared to shun the hot central ridge, and walked along the sides. Then he walked back, followed by several; then back once more with an increasing crowd, most of whom avoided the center. The horny-footed natives did the best. One white boy took off his shoes, but could not stand the heat upon his bare feet, and stopped. At this point (*i. e.*, after the second passage forward and back), I had the hottest stone of the pile in the center, on which the feet had certainly rested several times, hauled out and placed in the water bucket. The stone was much larger than I had reckoned or wished. A trifle of the water was spilled by the plunge, and the rest boiled hard and continued to do so for about 12 minutes. At the end of that time the stone was still too hot to handle, and I sent to the ship for a sack to hold it, directing the remaining water to be measured. It was a long stone; the lower part had been immersed in the central fire, and it was certainly much hotter than the average center stones. During this time other persons walked over the stones without special preparation, the disciples still dodging the hot central line and following near the cooler part. I asked Papa-Ita if he could take upon his hand a small hot stone near the center. He said he would, but he did not. Next many white persons walked over, stopping long enough to lean over and lightly and quickly touch the hottest stones with their hands. Mr. Ducarron walked to the center and stood there shifting his feet (he had on thin shoes) from stone to stone for about 10 seconds before finding it too hot to stay.

After this the outer crowd was allowed to come inside the barrier. It was a capital exhibition of savage magic and well worth seeing, but no miracle!*

* See Nature, August 22, 1901.

July 18.—We left at 10.30 a. m., the ship's upper deck being hung with bunches of bananas. As we went out of the harbor we passed wonderful green-yellow water inside the barrier reef, and we went over to the Island of Mourea (described in Melville's *Omoo*) to give the passengers a chance to visit it on the side not distinctly seen from Tahiti. It is very irregular in outline, with much finer cliffs than on Otaheite, and has one or two beautiful bays said to be good harbors. I understand that it would not be difficult to secure the whole island for a small sum.

We turned and went northward, bidding a good-bye to Tahiti and its "Diadem," which we are never likely to see again.

July 19.—The vessel rolls a good deal. The temperature is pleasant.

After lunch, weighed the stone which I got from those used in the fire-walk. It weighs 65 pounds, is about 15 inches in its longer diameter, and displaces $3\frac{1}{2}$ imperial gallons of water. After weighing, it was thrown overboard, a piece having been broken off to take home with me.*

* When I reached Washington I found it to be so porous that its specific gravity was but 2.39 and so non-conductible that a small fragment could be held in the fingers like a stick of

July 20-24.—On the 23d the sea almost glassy, reflecting the clouds.

On the 24th the smoke ceases to blow southwest from the funnel, and blows nearly south. The weather is still warm, but shows signs of getting cooler.

On the 25th, I think, or some later day which I did not note in my diary at the time, the whole sea around the ship seemed to be animated with spouting whales. We could see them at a distance as they rolled or played; and once a great shining black back, 20 to 30 feet of which was out of water, came directly toward the quarter of the ship, and was so near that we could have thrown a stone on it, when, apparently catching sight of the vessel, Leviathan dove, and made "the deep to boil like a pot," leaving a quarter of an acre of foaming ocean where he had gone down.

The diary does not appear to have been kept up for the next few days, which were pleasant, but uneventful.

In the early morning of the thirtieth of July we waited in a dense fog, and then moved slowly in through the Golden Gate, and reached the dock at San Francisco at about one o'clock.

sealing wax while the other end was made red-hot in a blow-pipe. This non-conductibility is evidently the principal cause of the success of the fire-walk "miracle."

THE LOST BOUNDARY OF TEXAS

BY MARCUS BAKER, CARTOGRAPHER, U. S. GEOLOGICAL SURVEY

THE law makes the 100th meridian of west longitude the boundary between Oklahoma and the panhandle of Texas. Similarly the law makes the 103d meridian the boundary (in part) between New Mexico and Texas. Recent government maps do not so show these boundaries, but place each one a little west of the meridian with which, by law, it coincides. These discrepancies have led to an inquiry as to the cause and as to our present knowledge of these boundaries.

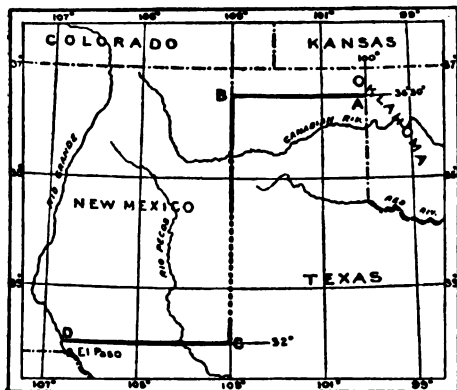
These and similar boundaries are established as follows: *First*, Congress enacts what the boundary shall be; *second*, the boundary is surveyed and marked in conformity with the law, and, *third*, the survey is confirmed. When all this has been done, the marks set by the surveyor become the boundary. Even if subsequent surveys disclose inaccuracies in the original survey, as it invariably does, nevertheless the monuments originally set, although inaccurately, remain the boundary. Permanence and certainty are of more moment than refinements of accuracy.

If the accuracy of a later and more refined survey was a sufficient warrant for changing a boundary once established, the later survey would itself be subject to like change when itself followed by a survey of yet greater refinement. Thus would result the intolerable nuisance and menace of a shifting boundary. The rule and the reason, therefore, unite in declaring that subsequent surveys are powerless to alter or to fix boundaries. Boundaries become established by mutual confirmation, such confirmation being either formal or presumed from long, notorious, and undisputed acquiescence. It is not the sur-

veying or marking done by the surveyor which establishes a boundary, but the acceptance and ratification of such survey by the parties. If neighbors dispute about their line fence, a surveyor is powerless to settle their dispute without the consent of both. This power to settle vests in the courts, which receive and weigh not only the testimony of the surveyor, but all other evidence pertinent to the dispute. Neglect of these obvious principles lies at the bottom of much boundary contention.

The boundary along the 100th and 103d meridians originated in 1850. In 1835 Texas declared her independence of Mexico, and on December 29, 1845, was admitted to the Union. It then comprised parts of territory now included in New Mexico, Oklahoma, Kansas, Colorado, and Wyoming. In 1850 Texas sold to the United States for \$10,000,000 all her territory north of latitude $36^{\circ} 30'$ and west of the 103d meridian as far south as latitude 32° . In the act of Congress of September 9, 1850, effecting this purchase, the boundary here considered first appears. That act recites:

"The state of Texas will agree that her boundary on the north shall commence at the point at which the meridian of one hundred degrees west from Greenwich is intersected by the parallel of thirty-six degrees thirty minutes north latitude, and shall run from said point due west to the meridian of one hundred and three degrees west from Greenwich; thence her boundary shall run due south to the thirty-second degree of north latitude; thence on the said parallel of thirty-two degrees of north latitude to the Rio Bravo del Norte." (See the line A B C D of the accompanying figure.)



CLARK'S SURVEY

About eight years later provision was made for running and marking this boundary by commissioners on the part of Texas and the United States. Mr. John H. Clark, who had had previous experience as an astronomer and surveyor in the "Far West" of antebellum days, was chosen early in July, 1859, as commissioner and surveyor on the part of the United States, and Mr. William R. Scurry on the part of Texas.

It was agreed that the survey should begin at the intersection of the 32d parallel with the Rio Grande near El Paso (D of Fig. 1), proceed east on that parallel to the 103d meridian (C), thence north on the 103d meridian to the northwest corner of the panhandle (B), and thence east on the parallel of $36^{\circ} 30'$ to the 100th meridian (A). With some modifications, due to lack of water and difficulty of travel, this plan was carried out in the years 1859 and 1860.

The station Frontera, of the Mexican boundary survey near El Paso, was accepted as the starting point for longitude, and its longitude transferred, by chaining and triangulation, about a dozen miles northward to the 32d parallel. The party then chained eastward along the 32d parallel for 211 miles, the calculated distance to the 103d merid-

ian, and there set a monument (C). Its longitude was not then nor has it been since checked by astronomical observations. Having set this corner monument, the party started northward, but, owing to the total absence of water, were compelled, after proceeding about 20 miles and setting two monuments, to leave the line and go in search of water. Clark thereupon decided to ascend the Pecos River and measure offsets to the boundary; but the distance proved so great that he gave this up and proceeded to the northwest corner (B) and set about carefully determining this important corner. An astronomical camp was established in its vicinity, on Rabbit Ear Creek, and while engaged in observing with zenith telescope for latitude and moon culminations for longitude a surveying party was sent north about 35 miles to the 37th parallel to transfer the longitude found by Clark, in 1857, on that parallel southward to the parallel of $36^{\circ} 30'$. This was done, and the northwest corner post of Texas (B) established as to its longitude by transfer from the 37th parallel, and as to latitude by independent astronomical observations. Of the astronomical observations made by Clark to check this transfer no use has ever been made. This done, Clark ran southward for 156 miles, chaining the distance, checking by sextant observations, and building mounds or monuments to the number of 23. He then closed work for the season. The result of this season's work of 1859, so far as concerns the 103d meridian, was as follows: Monument set at the south end, fixed in longitude by chaining about 225 miles from Frontera, on the Rio Grande, without astronomical check; monument set at north end, its longitude being derived by transfer 35 miles from the 37th parallel, the longitude on that parallel being based on moon culminations observed in 1857; the running of the line northward from the south end 24 miles and erection of two

monuments; the running of the line southward from the north end 156 miles and erection of 23 monuments, leaving 130 miles between unsurveyed and unmarked.

SURVEY OF THE NORTHERN BOUNDARY

In the following season Clark began work on the 100th meridian, where it crosses the Canadian, and accepting, as directed, the monuments set there by Jones and Brown in 1859 to mark the 100th meridian, prolonged the line northward to latitude $36^{\circ} 30'$, and there built a monument (A) to mark the northeast corner of the panhandle. To check this position he prolonged this 100th meridian northward about 35 miles, to the 37th parallel, and found that the longitude of the northeast corner of Texas on the 100th meridian, according to Jones and Brown, was about 1,700 feet east of the 100th meridian, according to his own determinations on the 37th parallel in 1857.

He then ran west on the parallel of $36^{\circ} 30'$ till forced to leave the line for water. Then he went to the west end and surveyed east till he reached the point where the earlier work ended, thus finishing it. He then disbanded, returned to Washington, and proceeded to work up the results, draw the maps, and make final report. The great war cloud was then hanging over Washington; there was great impatience to close up this work; there appears to have been friction over seeming slowness in finishing up. Accordingly the work was abruptly stopped, unfinished, in January, 1862. So it remained for 20 years. In January, 1882, the Senate by resolution called for Clark's report. The result is a document of 309 pages of field-notes, correspondence, maps, etc., which, while giving much information, leaves much to be desired.

DISAPPEARANCE OF MONUMENTS SET BY CLARK

On March 3, 1891, Congress confirmed Clark's survey of the 103d meridian and of the parallels of 32° and $36^{\circ} 30'$. *Of the 26 monuments set by Clark on the 103d meridian, only two have been reported to the General Land Office.* These are on the banks of the Canadian River. The surveyors, Taylor and Fuss, who connected the public land surveys of New Mexico with these monuments, recognized them as boundary monuments, but made no determination of their longitude.

The initial monument at the northwest corner of Texas has been sought for by subsequent surveyors but without success. Mr. John J. Major sought for it in 1874, failed to find it, and "reestablished" it, setting a new one, which there is excellent reason for believing is more than two miles west of the Clark monument. Mr. Richard O. Chaney, in 1881, set another monument at the theoretical northwest corner of Texas, and this without finding either Clark's or Major's monument. Based upon these and other surveys not here mentioned, the Land Office has concluded that Clark's 103d meridian was laid down between 2 and 3 miles west of its true position, and it is so shown on the Land Office map of New Mexico, 1896. After examining with some care the information on the subject now available, I am of opinion that this conclusion is not sustained by the evidence, and that until the longitude of some monument set by Clark has been telegraphically determined the boundary line should be shown on maps as coincident with the 103d meridian.

It is very desirable that this boundary be resurveyed, old monuments restored, and additional ones erected, before the discovery of oil or mineral shall provoke a boundary dispute.

ICE CAVES AND FROZEN WELLS

A NOTEWORTHY contribution to an interesting topic appears in the August number of the *Monthly Weather Review* (issued October 31, 1901) under the title "Ice Caves and Frozen Wells as Meteorological Phenomena," by H. H. Kimball, of the U. S. Weather Bureau (vol. xxix, pp. 366-371, pls. I-III). The paper is partly a compilation, partly a record of observations on the widely known Brandon well and at other localities; it may be regarded as a supplement to the book on *Glacières, or Freezing Caverns*, published in 1900 by Edwin Swift Balch. The well-known ice caves, and some not so well known, are described critically, with due attention to actual temperatures and to seasons; and a few ice wells are similarly described. The popular idea that the ice accumulates in summer and disappears in winter is rejected in toto; and the author concludes: "It is evident that ice caves and frozen wells are but different manifestations of the same phenomenon. In both cases the cold air of winter circulates to unusual depths below the surface, and freezes the small quantity of water with which it comes in contact. In summer this subterranean circulation of the air ceases, and heat finds its way to the ice only by the slow process of conduction. In consequence, the ice that accumulates during the winter and early spring may not entirely disappear during the following summer, but continue to accumulate for ages."

It is greatly to be regretted that recent writers on ice caves and frozen wells have not extended observation to the "blowing caves," "breathing wells," and "whistling wells" found in various parts of this and other countries, and sporadically recorded in ephemeral literature; for the physical laws exemplified in these are alike, and pre-

sumptively connected with those revealed in glacières and ice wells. The fact is too often overlooked that the normal or ordinary cavern is a "breathing cave," in that air currents flow alternately in and out with a degree of regularity conditioned by many factors, among which varying atmospheric pressure is the primary one. The strength of the "breathing" depends on the relative sizes of the opening and of the subterranean vault or chambers; when the mouth is small and the cavern large, the inspiration may be strong enough to suck in dead leaves or sway overhanging branches, while the expiration may suffice to send dry leaves high in air or blow off the hats of incautious visitors; though when the aperture is large or multiple and the cavern small, the current may be barely perceptible. The regular breathing is diurnal, lagging behind the daily range of the barometer by minutes or hours, according to the relative dimensions of orifice and vault; though the diurnal rhythm is modified and sometimes obscured by more general changes in atmospheric pressure, and also by temperature conditions. In cavernous limestone regions where winter snows lie deep, cave-hunting boys soon learn to find hidden orifices and to estimate the magnitude of the caverns by the vapor columns emitted on frosty mornings after a snowfall followed by the customary drop in temperature, the steam columns sometimes rising hundreds of feet in a density rendering them visible for miles. The "blowing well" is the homologue of the "breathing cavern," save that the subterranean vault is replaced commonly by a porous stratum or formation, usually coarse sandstone or granular dolomite; though it is possible that some such wells penetrate or communicate with open fissures or extended crevices in

the rocks. There is a region of blowing wells in southeastern Wisconsin, where the Calciferous beds of the Silurian rest on the coarse-grained St. Peter sandstone; another is reported in central New York, where impervious strata overlies the pervious Potsdam sandstone; still another occurs in England, where it received attention a few years ago in connection with water-supply inquiries; while sporadic examples are by no means uncommon elsewhere.

Now it is evident that when the barometer is high in a region of caves or breathing wells, the subterranean chambers or pervious beds will gradually fill with the slightly compressed air, and that the process of filling will be accompanied by inspiration, or in-blowing, through the open mouth; it is equally evident that with the subsequent fall of the barometer the imprisoned air will expand and force itself outward through the mouth of the cavern until the pressure within and without is brought into balance. Furthermore, it is evident that the air expanding in the throat of the orifice will abstract heat from surrounding substances, precisely as it does in the expansion chamber of an atmospheric ice machine, at a rate and to an amount varying with the pressure-difference;

and hence that (provided other conditions be favorable) the moisture on adjacent surfaces may be congealed. In short, under favorable circumstances the breathing well or blowing cave may become a natural ice machine, clumsy and inefficient, indeed, yet possibly making up in magnitude for its simplicity and the slightness of the pressure-differences within its reach. Of course it would seem at first sight that in each passage from low pressure to high and back again, as in the long run, the effects of the natural mechanism would balance—*i. e.*, that the heat given off in inspiration would equal the chill of expiration, so that no refrigeration could ensue; yet when the seasonal ranges of barometer and thermometer are considered, it would seem clear that the heating would tend to culminate in autumn and the chill in spring, in such wise as to sustain the widespread popular opinion on the subject—*i. e.*, that the period of ice-melting runs into winter and that of ice-forming into late spring and summer. In any event the discussion of glaciers and freezing wells cannot be regarded as closed until the related phenomena of blowing caves and breathing wells receive exhaustive study.

W J MCGEE

WESTERN PROGRESS IN CHINA

MINISTER CONGER has forwarded the State Department a translation of the preliminary resolutions adopted by the recently organized Board of National Administration of China. The purpose of the Board is to institute reforms in China of a more moderate nature than the sweeping reforms proposed in 1898 which brought on the Boxer troubles.

"The things of the West are genuine; those of the Chinese, for the most

part, are shams. The speech of Western men is reliable; that of the Chinese largely false," say the Board, and in this spirit of Chinese modesty and humility the resolutions were written. The following extracts are taken from these curious resolutions to show the nature of progress thus far made:*

"The first thing necessary is to manifest resolution like an upright pillar;

* The resolutions are published in full in the Consular Reports for October 28 (no. 1173).

then may one accomplish the splitting of the bamboo—*i. e.*, the difficult task. The Book of History says: 'Hold fast the golden mean.' And again, 'Only with decision of character can there be completion of a work.' These words sum up the case. . . .

"In modifying the government, the most important things to be considered are two: In the first place, the old customs were good, but, having been in operation a long time, a great many abuses and obstructions have grown up. The administration of the law should be thoroughly reformed and restored to its early condition. In the second place, what is lacking in the Chinese law should be supplied by an admixture of Western law, so that in time we may gradually become wealthy and strong. . . .

"The object of the establishment of this Board of Administration is to promote the independence of China. China's weakness is due to her poverty. The strength of foreign powers is due to their wealth. Deliverance from poverty, therefore, is the very beginning and foundation of independence. But the commencement of reform ought not by any means to wait upon the attainment of wealth. At present China has but a slender thread of life—merely the loyalty of her people; and at a time when bands of brigands are spread abroad, mutually deceiving and inciting one another, if the very first thing done is to search the Empire for money, it will shortly be said that of the thousand benefits promised and the hundred ills from which men are to be delivered, not one of the former has been gained nor one of the latter removed. Such a method is a direct oppression of the people and will alienate men's hearts. Though you may have very excellent plans, they will be difficult to carry out. But let us first remove one or two of the abuses complained of throughout the Empire, and carry into execution one or two of the things most desired,

and we will cause the people of the whole Empire to know that the reforms projected by the court really have in view the promotion of the prosperity of the people and the removal of the ills from which they suffer. . . .

"In all matters let there be a purpose to search out the facts, and afterwards every edict issued will operate like running water. Heretofore, there have been debts to the foreign powers unpaid; now there is the pressure of the indemnity, amounting to more than 20,000,000 taels per annum. How are we to obtain such a sum? There are but two roads to wealth—one is to increase the revenues [literally, 'open the springs'], and the other is to economize in expenditure. An increase of the revenues will be either too gradual to meet the pressing demand, or it will be a case of 'seeking money and incurring odium.' This, therefore, is not so good as practicing economy in expenditure. Economy in expenditure means nothing else than the discharge of useless troops and the saving of their pay, the discharge of extra officials and the saving of their salaries, the abolition of useless offices and factories and the saving of the money spent on them. Pay for soldiers, official salaries, and other expenditures are all the very flesh and blood of the people of the Empire. . . .

"In the south and east certain provinces have begun the adoption of Western customs, and say there is nothing to fear or suspect in Western methods. But the people of the north and west are simple in their habits; their eyes and ears have had no broad experience, and to abruptly order them to change their manners is no wiser than the sounding of a cymbal for a deaf man to hear or the endeavor to peel a water nut with a lotus stem. In reforming the customs, therefore, it is decidedly difficult to make a plan of universal adaptability which may be put in operation among all the people of the whole

Empire. The plan must be adjusted to the character of the locality and developed according to the circumstances and prosperity of the people. Moreover, in adopting Western methods, we must remember that there are differences in Western forms of government and in Western industries.

"If we desire to obtain the material benefits of their civilization, we must first learn their hearts. The hearts of Western men are interested in the public welfare, while those of the Chinese, for the most part, are devoted to selfish concerns. . . . Thus naturally the two races are very unlike, and in endeavoring to adopt their civilization we get no more than the outside. Though ten thousand men should join together in the effort and labor through a hundred years, it would be very difficult to complete the transformation.

"From the first year of T'ung-chih (1862) down to the present, there has never been a time when we have not talked of foreign affairs. Institutions

and factories have grown up like a forest, and ships and cannon have outnumbered the clouds; yet in thirty years what effective change has been completed? The reason for our failure is that while among Western people in their undertakings a thousand men are of one mind to secure the prosperity of the state—and securing the prosperity of the state benefits individuals as well—among the Chinese, in their affairs, a hundred men have a hundred minds, each seeking his own advantage, and while some profit and others do not, the state does not obtain the least benefit. It is for this reason that shares are not sold and that corporations are dissolved. In undertakings which the foreigner finds profitable, the Chinese, in their endeavors to imitate, find nothing but losses to make good. The hearts of the Chinese must first be rectified, and then they may imitate the excellent methods of the West; but to straighten the foundations and to cleanse the fountain, this is not a task for one man."

GEOGRAPHIC NOTES

TAHITI

THROUGH the courtesy of Mr. S. P. Langley the NATIONAL GEOGRAPHIC MAGAZINE is able to publish this month the diary of his recent trip to Tahiti. The diary is published as it was written from day to day, without any alterations, and is an entertaining story of several weeks passed in a fascinating part of the globe.

Tahiti was discovered in 1606 by Quiros, who named it La Sagittaria. One hundred and sixty one years later Captain Wallis rediscovered the island

and called it after his sovereign King George. The native name, formerly spelled Otaheite, asserted itself, however, and is now alone used. Tahiti was Captain Cook's favorite center when exploring the Pacific. It was on this island he observed the Transit of Venus on his first great voyage of exploration in the Pacific. English missionaries settled in Tahiti near the close of the eighteenth century, and for some years met with considerable success. France declared a protectorate over Tahiti and the Society Islands in 1842, and in 1880 formally annexed the group.

LITERACY OF THE MEN OF THE UNITED STATES

THE most literate element of the male population of the United States is the native white of foreign born parents. Ninety-eight of every 100 men, 21 years of age or over, who were born in this country of white foreign parents can read and write. A less proportion of the native white of native parents read and write—94.2 per cent—while not quite nine-tenths of the foreign born men and only a little more

than half of the colored men can read an addressed envelope or write a receipt. The following diagram shows the reading and writing ability of American men of voting age in each element. There are 21,329,819 males of voting age in the United States. Of this great army of men 19,003,524 read and write and 2,326,295 are capable of neither—that is, of the total male population who are of voting age in the United States 891 in every 1,000 are literate and 109 are illiterate.*

* See Census Bulletin no. 106.

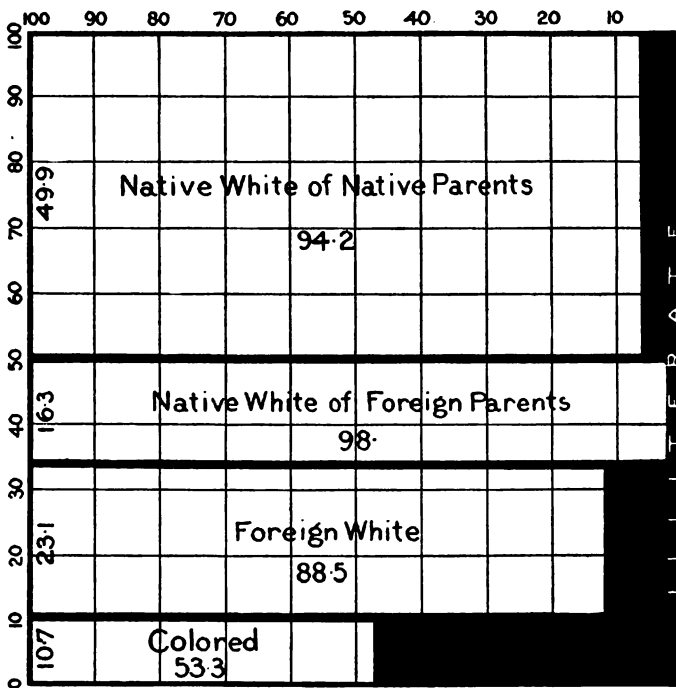


Diagram showing literacy of males 21 years of age and over in the different elements of the population

The diagram also shows the percentages of the different elements in the total male population that is 21 years of age and over



Outline Map showing route of Trans-Siberian Railway

TRANS-SIBERIAN RAILWAY

THE month of November marked the practical completion of the Trans-Siberian Railway. For Russia and Siberia the road has tremendous possibilities. It means to her vast Siberian territory the development and prosperity which the first belting of the American continent brought to the West. For Europe, especially western Europe, it means even more perhaps than to Russia. The road marks the inauguration of a new route to the Far East. The Siberian Railway will gradually supplant the Suez route, and make Russia, not England, the mistress of the world route to the Far East. An article that appeared in this Magazine in September, 1901, dwelt at length on the construction and meaning of this Trans-Asiatic railway. The Manchurian branch of the railway, with map, was described in the August, 1900, number.

ICE IN SOUTHERN LATITUDES

THE three expeditions now in South Polar regions will this season have to contend against ice extending more to the northward than usual. Mr. James Page, of the U. S. Hydrographic Office, sends to this Magazine the following paragraphs from the report of Capt. John N. Start, in command of S. S. *Star*

of *New Zealand*, describing the icebergs seen during a voyage from Bluff, N. Z., to London:

"During passage passed icebergs as follows: September 6, 1901, latitude $53^{\circ} 24' S.$, longitude $142^{\circ} 16' W.$, passed a very large berg (over a mile long and over 600 feet high). Temperature of air, 37° ; water, 41° . September 7, on the same parallel, between $140^{\circ} W.$ and $135^{\circ} W.$, passed 77 large bergs and numerous small ones, weather getting thick and dirty and ice very thick; kept ship off to N. N. E. September 8, latitude $51^{\circ} S.$, longitude $131^{\circ} 30' W.$, passed 11 large bergs and numerous small ones. Air, 45° ; water, 44° . On the parallel of $50^{\circ} 20' S.$ and between $128^{\circ} 30' W.$ and $124^{\circ} W.$ passed 10 large bergs and numerous small pieces. Temperature of air, 47° ; water, 44° .

"Bergs were mostly of the table form, with sheer precipitous sides, showing clearly each stratum of snow in formation. In height they ranged from 370 feet to over 600 feet (height determined by sextant and distance). A number seemed of irregular shape, having been longer adrift and wasted by action of seas and heat. From the date last given no further ice was seen, the vessel making casting just north of the average ice-line shown on the chart.

"September 27, in latitude $20^{\circ} S.$, longitude $30^{\circ} W.$, between 6.30 and 7

a. m., we passed through a belt of whirlwinds 5 to 6 miles wide, extending to the horizon in either direction. Previous to this the wind had been blowing a moderately fresh breeze, varying from east to S. E., with rainy, dirty weather without any interval. The vessel passed into the belt. The whirlwinds were simply in hundreds and quite close to each other, so that the water was torn up into whirls in opposite directions every few feet, one blowing spray over the vessel on one side and another on the other side. The vessel passed out of the belt quite as suddenly into a fresh breeze from N. N. W. and the weather cleared up."

IN THE CANADIAN ROCKIES

A SUCCESSFUL exploratory trip was carried out last summer in the Canadian Rockies by Messrs. Henry G. Bryant and Walter D. Wilcox. The outfit consisted of fourteen pack and saddle horses, two experienced packers, and a cook, three tents and provisions sufficient to last two months.

Their main purpose was to explore and map a portion of the Rocky Mountains south of the Canadian Pacific Railway, between the Kootenai and Elk Rivers. This region is part of the main chain of the Rockies. It is about 75 miles long and from 25 to 30 miles wide, and had been hitherto unexplored, except for Captain Palliser's rapid journey over Kananaskis Pass many years ago.

The most important results obtained by Messrs. Bryant and Wilcox were the exploration and mapping of the upper part of the Palliser River and of the headwaters of several rivers flowing into the Elk, some important data about the Kananaskis Lake region, and the correction of errors in regard to the altitude and other details of the Kananaskis Pass. During the journey four passes were crossed and five large valleys explored, in the course of which a num-

ber of lakes and other interesting features were discovered, mountain ascents made, and a valuable series of photographs secured to illustrate the scenery and methods of travel. A small collection of fossils and stones was made for the benefit of geological knowledge of the region, and a set of panoramic views and roughly triangulated points will provide material for a new map of this very picturesque and interesting part of the Rockies.

An article by Mr. Wilcox, describing the work done and illustrated with maps and photographs, will appear in an early number of this Magazine.

The Population of the Argentine Republic now amounts to 4,800,000, of whom more than one-fourth, or 1,250,000, are foreigners. Four-fifths of the foreigners are from the Latin countries—Italy, Spain, and France. Buenos Aires, with a population of 829,891, ranks as the first city in the southern hemisphere and is the second city of Latin races in the world. A recent estimate gives the following figures:

Italians	635,000
Spanish.....	250,000
French.....	115,000
Oriental.....	60,000
Brazilians	15,000
English.....	28,000
Chileans	26,000
Germans.....	22,000
Russians.....	20,000
Swedes.....	20,000
Others.....	59,000
Total foreigners	1,250,000
Total natives.....	3,550,000
Grand total.....	4,800,000

Draining of the Zuider Zee.—United States Consul Hill, at Amsterdam, reports that the project for draining the Zuider Zee has been withdrawn indefinitely from the States-General by the new ministry. The condition of the Dutch budget is so low that it could not furnish the funds for such an expensive

work. Furthermore, the price of land in the kingdom has fallen, making new agricultural holdings undesirable.

Hon. Seth Low has resigned the presidency of the American Geographical Society of New York city. Mr. Low was elected president to succeed the late Judge Daly.

It is announced in the *Geographical Journal* that a magnetic survey of India is to be made by the Indian Government. In addition to the observatories at Bombay and Calcutta, others are to be built at Dehia Dun, Kodaikanal, and Rangoon. The work is to be directed by the Survey and Meteorological Departments jointly.

Colonial Administration is the title of a special report by Hon. O. P. Austin, Chief of the Bureau of Statistics of the Treasury Department, now in press and soon ready for distribution. Mr. Austin passed the earlier months of 1901 in the capitals of Europe studying the colonial departments of the European governments, and this important volume is the result of his researches and observations.

Not one case of yellow fever occurred in Habana during the month of October, the month during which the fever is most prevalent in Cuba. In October, 1900, there were 308 cases, of which 74 died. This remarkable change is the result of an untiring war on the mosquito, waged by the sanitary officers of Habana. Major Gorgas, chief medical officer of Habana, reports that no attempt was made to disinfect clothing or to enforce quarantine against the neighboring towns where yellow fever was active. Their only aim was to kill the mosquitoes that had bitten a sick person, and to prevent any more mosquitoes from biting after the case was discovered. There is today an immune population of about 40,000 persons in Habana, which yellow fever has ravaged for 150 years.

A Map of the territory of the Amazon has been prepared and published by Ermanno Stradelli. It is based principally on his own extended explorations in west central Brazil, east of Peru and Bolivia. Mr. Stradelli's work in this region has been very important, as he has ascertained the course of several large southern tributaries to the Amazon, and shown that their career is quite different from that hitherto given on South American maps. Mr. Stradelli's map is on the scale of about 32 miles to the inch.

The reciprocity treaties and agreements between the United States and foreign countries since 1850 is the subject of a very timely report issued by Hon. O. P. Austin, Chief of the Bureau of Statistics of the Treasury Department. The text of these treaties is given in full, and also the text of such treaties as have been negotiated and are awaiting action. The agreements awaiting ratification by the United States Senate are conventions with Argentina, the French Republic, Bermuda, Jamaica, British Guiana, and Barbados. This valuable bulletin may be obtained by application to the Bureau of Statistics.

The effects of the drought of July, 1901, upon the trade, industry, and commerce of the United States are admirably described by Dr. R. DeC. Ward, of Harvard University, in an article in the *Bulletin* of the American Geographical Society. One striking instance of the effect of the drought may be cited. The withering of the pasture in the southwest compelled the stockmen to ship thousands of cattle to the markets weeks before they had planned. At Kansas City alone, during the month of July, 1901, 263,000 more head of cattle were received than in July of the preceding year. As a result the market was so overstocked that the buyers dictated prices.

Naturalized Foreigners in the United States.—Nearly two-thirds of the foreign born males of voting age in the United States are naturalized or have filed their first naturalization papers. There are about five million foreign born men (5,006,483) who are 21 years or over in the United States proper. Of these, 2,848,324 are naturalized, 412,513 have taken out their first naturalization papers, 1,001,124 have made no application to become American citizens, and the condition of 744,522 is unknown—that is, of every 1,000 foreign born males of voting age 569 are American citizens, 82 have taken steps to become American citizens, 200 are still aliens, and the condition of 149 is unknown.

The British Government has made arrangements to send its mail for Australia and New Zealand via the United States instead of by the present route down the Suez Canal, the Red Sea, and across the Indian Ocean. This announcement is made by George H. Daniels, general passenger agent of the New York Central. A fast steamer will convey the mail to New York, where it will be placed on a Pacific Coast express and connect with the Oceanic Steamship Company vessels at San Francisco. On an average, six or seven days will be saved in the passage to Australia. Doubtless Europeans bound for Australia will soon follow the mail. The time gained is a small advantage to the traveler compared to the comfort of passing the entire trip in a cool climate instead of sweltering on a slow steamer on the Red Sea and Indian Ocean.

The completed report of the Isthmian Canal Commission differs but slightly from the preliminary report of the Commission, an abstract of which, with map, appeared in the January, 1901, number of this Magazine. The Commission, as before, favors the Nicaragua route, esti-

imating that the canal by this route would cost \$63,500,000 less than the sum for which the Panama property can be purchased and the canal completed. The final surveys have shortened the proposed Nicaragua route three miles, and have enabled the Commission to plan for eight locks instead of nine. The entire distance is now 183.66 miles, of which 73.78 miles are of the canal proper, and the remainder lake and river. The total cost is estimated at \$189,000,000, which is \$11,000,000 less than the amount previously reported. This large sum saved is because the engineers have discovered a better site for the gigantic dam that must be built to regulate the level of Lake Nicaragua.

Territorial Expansion of the United States.—The additions made to the thirteen original colonies and the transformation of this territory into separate territories and states is admirably described in a recent useful report by Hon. O. P. Austin. Mr. Austin has shown the different changes in state and territorial boundaries by a series of diagrams. For instance, diagram No. 7, 1803, presents the Louisiana Purchase as one province; No. 8, 1804, shows the province divided into the Louisiana District and the Territory of Orleans; No. 10, 1810, shows the Orleans Territory admitted as the State of Louisiana, and the Louisiana Territory changed in name to the Territory of Missouri. The successive breaking up of the Territory of Missouri into the Territory of Arkansas and the State of Missouri, and all following changes are graphically shown. The diagrams form a series of moving pictures of the rapid changes in the boundaries of our fifty odd states, territories, and possessions.

The Military Information Division of the War Department will publish within a few weeks a comprehensive report on the colonial armies of the great powers.

GEOGRAPHIC LITERATURE

***Alaska:** Volume I, Narrative, Glaciers, Natives. By John Burroughs, John Muir, and George Bird Grinnell. Volume II, History, Geography, Resources. By William H. Dall, Charles Keeler, Henry Gannett, William H. Brewer, C. Hart Merriam, George Bird Grinnell, and M. L. Washburn. New York: Doubleday, Page & Company. 1901. [Superimprinted] Harriman Alaska Expedition, with the coöperation of the Washington Academy of Sciences. [Edited by Dr. C. Hart Merriam.] With 39 colored plates, 85 photogravure plates, 5 maps, and 240 text figures. Pp. xxxvii, 383. \$15.00

One of the handsomest pieces of book-making ever produced has recently appeared in the form of a report on the Harriman Alaska Expedition. The two sumptuous volumes are models in such matters as typography, paper, binding, and the like; they are unique, at least so far as solid scientific literature is concerned, in certain matters of execution, such as the neat loose covers matching the permanent binding; the numerous color-plates touch a new apex in the triangular ideals of fidelity to nature, strength of expression, and refinement in line and tone; the photogravures are unexcelled examples of that mode of picturing which was last century's richest gift to art, while the text cuts are at once germane, graphic, and artistic. The first impression produced by the book is that it is a thing of beauty.

The body of the work begins with John Burroughs' narrative of the expedition. It is a novel chapter in the history of expeditionary enterprise. The family would go a-touring; the head

thereof would have the tour instructive; so the family was temporarily enlarged to a ship-load of congenial folk, including a "scientific party" of 25 eminent savants who were to breathe out the instruction. Then, to tempt the grave and reverend seigniors, as well as to give zest to the lessons, provision was made for research along new lines—for actually augmenting the sum of human knowledge—and a corps of artists, photographers, stenographers, and doctors was added, together with officers and crew of the good ship *George W. Elder*. The full outfit aggregated 126 persons, with such facilities and supplies that when all was done (with the milch cow left over) and the party debarked, the faithful poet-scribe jotted the feeling that all "had traveled far and fared well" ere he dropped his pen. Yet, before reaching this mild benediction, he drew one of the most telling word pictures of geographic journeying ever done in this land of magnificent distances. The enthusiastic glacialist, John Muir, follows Burroughs with a memoir on "Pacific Coast Glaciers," and the versatile editor of *Forest and Stream*, Dr. George Bird Grinnell, describes the "Natives of the Alaska Coast Region." Both of these contributions represent the results of previous researches, as well as those of observations made during the expedition; and the legion of new-found and newly christened glaciers receive special attention. The second volume opens with a succinct account of discovery and exploration in the territory by the veteran Alaskan, Dr. W. H. Dall; Dr. Charles Keeler describes the birds, and Prof. Bernard E. Fernow discusses the forests; Henry Gannett follows with a summary of Alaskan geography, already printed in this Magazine, while Prof. William H. Brewer discusses the peculiar atmos-

* "The General Geography of Alaska," by Henry Gannett, one chapter in this remarkable work, was published in full in the May, 1901, number of this Magazine.

pheric effects of Alaska; Dr. Merriam describes "Bogoslof, our newest Volcano," and Dr. Grinnell and M. L. Washburn, respectively, summarize the salmon industry and the fox farming of our remote commonwealth—and more strictly literary features attest the inspiration of a trip in which the prosaic and the poetic were so happily blent. Naturally, in view of the eminent authorship, these several chapters are notably authentic and trustworthy; and the whole must long serve as the standard source of general information concerning the vast territory just entering on a promising career of industrial, commercial, and social development. Nor are these two volumes all; for additional chapters, prepared through the coöperation of the Washington Academy of Sciences, are to follow so soon as the material is elaborated.

The work is a notable one in plan and scope, and in the combination of utility and beauty displayed by the volumes—indeed, such are its excellencies that the chief imperfections readily detected are merely (1) insufficient recognition of the editorial labors, and (2) the absence of a trenchant title—for, despite an acceptable title-page caption the full titles are unlike, and the name on the back is that of the expedition and not that of the book.

W J M.

'Twiṣt Sudan and Menelik. By Capt. M. S. Wellby, with many illustrations and two maps. New York: Harper & Bros. 1901.

There is an art of travel in wild countries; an art made up of all sorts of applied knowledge—physiology, medicine, engineering, cooking, shooting, and human sympathy. Of this art Captain Wellby was a master, and a greater master, I think, than would be suggested by his book, save to those who have had some experience similar to his own. There is no systematic attempt to teach

his art, nor is there indeed any systematic presentation of the results of a very notable journey through unknown regions. The author explains that preparation for service in South Africa followed fast upon his return from the Sudan. There was thus but little time for the sifting and arrangement of the very large mass of material which must have been obtained by a traveler of such experience and intelligence.

Yet all who are interested in African exploration must rejoice that fate permitted the making of this straightforward story before carrying its author to an heroic death on the veldt. In the book one finds something of that oversupply of detail which mars nine-tenths of all the books of travel. Yet happily Captain Wellby had an instinctive elective faculty which gives to the greater part of even the trivial recitals a value either for the stay-at-home or for other wanderers. Indeed, for the traveler, some hints may be taken from almost every page. And the chief lesson is perhaps this: that kindness of heart and sweet charity are not thrown away when shown toward black Africans. Nay, not more than if shown to your own friends. A less sympathetic man, a man less truly brave than Captain Wellby, might have recounted more of startling adventure and less of instruction.

The most valuable portion of the book is, of course, that dealing with the journey from Addis Abeba to the White Nile, since the route from Zeila to Addis Abeba is already well known. Captain Wellby's narrative has much importance as bearing upon the country and peoples met as one travels southwestwardly from Menelik's capital. Intertribal feuds and Abyssinian raids may seriously change the locus, the numbers, even the views, of several small tribes whose present habitat had never, before Captain Wellby's appearance, known the white man's presence. This first record is therefore of spe-

cial importance to the student of primitive man. A suggestion of the varied experiences met with in the journey through the Lake Rudolf (or Gallop) region and the country lying to the west of the lake is had in reading the list of the names of tribes, many of them unknown, none of them well known. Thus, Arusi Galla, Walamo, Alibori, Wangobeino, Gallopa, Lokub, Turkana, Loka, Abbas, Tamata, Boma, Morelli, Shillaks, and Dinkas. Of these the Walamo are noteworthy for their alleged and widely credited power of bewitching with devils. The Turkana are remarkable for their great size. Captain Wellby puts a higher estimate than most travelers upon the capacity of the Abyssinian character in respect to the higher emotions—friendship, charity, generosity—the very qualities which would be most readily developed by his own lovable nature. One is permitted to doubt the author's prediction that most of their present defects will be largely cured by intercourse with Europeans. In using well-established native names of lakes and rivers, rather than those proper names of European travelers assigned for glory's sake, Captain Wellby administers a reproof to vanity. The general reader of this important book will inevitably feel a sympathetic interest in its author. The graceful introduction and epilogue, written respectively by his friends Colonel Harrington and Sir Rennel Rodd, will pleasantly gratify this interest. Many good photographs and two maps add to the value of the text.

OSCAR T. CROSBY.

Animals of the Past. By F. A. Lucas. With many illustrations. New York: McClure, Phillips & Co. \$2.00.

Mr. Lucas has given the public a book that has long been needed, an authoritative but simply written account of the strange animals of past ages. In a chapter on the "Rulers of the ancient seas," the author sketches the succes-

sive races of creatures who ruled the oceans long before the advent of man. "For a time the armor-clad fishes held undisputed sway; then their reign was ended by the coming of the sharks, who in their turn gave way to the fish-lizards, the Ichthyosaurs and Plesiosaurs." Then came great marine reptiles, who extended their empire from New Zealand to North America, the Mosasaurs. These maintained their headquarters in the oceans that rolled over western Kansas. As this great plain in the course of hundreds of centuries was gradually lifted, they were imprisoned, the weaker captured by the stronger, and in time even the latter were strangled by the freshening of the water or starved by the disappearance of their food supply. Then sharks came into power again, small sharks with little teeth and great sharks with gaping jaws six feet across and inside hundreds of gleaming teeth, three, four, and five inches long. These enormous sharks swarmed everywhere that the water was warm, and then they disappeared utterly. Chapter headings of the volume are as follows: "Fossils and how they are formed," "The earliest known vertebrates," "Impressions of the past," "Rulers of the ancient seas," "Birds of old," "The Dinosaurs," "Reading the riddles of the rocks," "Feathered giants," "The ancestry of the horse," "The mammoth," "The mastodon," "Why do animals become extinct?"

Our National Parks. By John Muir. With illustrations. New York: Houghton, Mifflin & Co. \$1.75.

The magnificence of scenery of the western United States and what is being done to preserve it by reservations like the Yosemite and Yellowstone National Parks is the theme of this volume. Mr. Muir says his aim in writing the series of sketches has been to incite people "to come and enjoy them [the national parks] and get them into their hearts,

that so at length their preservation and right use might be made sure." The following paragraph, quoted from Mr. Muir, describes the rapid change that has taken place by the hand of man :

"Only thirty years ago, the great Central Valley of California, five hundred miles long and fifty miles wide, was one bed of golden and purple flowers. Now it is ploughed and pastured out of existence, gone forever,—scarce a memory of it left in fence corners and along the bluffs of the streams. The gardens of the Sierra, also, and the noble forests in both the reserved and unreserved portions are sadly hacked and trampled, notwithstanding the ruggedness of the topography,—all excepting those of the parks guarded by a few soldiers. In the noblest forests of the world, the ground, once divinely beautiful, is desolate and repulsive, like a face ravaged by disease. This is true also of many other Pacific Coast and Rocky Mountain valleys and forests. The same fate, sooner or later, is awaiting them all, unless awakening public opinion comes forward to stop it. Even the great deserts in Arizona, Nevada, Utah, and New Mexico, which offer so little to attract settlers, and which a few years ago pioneers were afraid of, as places of desolation and death, are now taken as pastures at the rate of one or two square miles per cow, and of course their plant treasures are passing away,—the delicate abronias, phloxes, gillias, etc. Only a few of the bitter, thorny, unbitable shrubs are left, and the sturdy cactuses that defend themselves with bayonets and spears."

Commercial Geography. By Cyrus C. Adams. With illustrations and maps. New York: D. Appleton & Co.

In breadth of treatment and systematic plan this book is equaled by no commercial geography yet published. Mr. Adams is an eminent expert on the editorial staff of the *New York Sun*

and has spent many years studying the problems of commercial geography. He has successfully aimed in the present volume to keep constantly before the reader the geographic influences affecting commerce. Very few statistics are given, their place being taken by diagrams and charts. Instead of grouping the different products under the traditional heads of animal, vegetable, and mineral commodities, Mr. Adams has treated each product in connection with that country in whose commerce it is most prominent. For instance, cotton is discussed under the United States, which produces three-fourths of the raw cotton of the world.

The book is written in a simple and entertaining style that commends it to every one. The volume is especially fortunate at the present time, when the people of the United States are thinking about and studying the problems of commerce as perhaps they have never done before. One who wishes to refresh his mind as to what the different nations have to offer each other could not do better than read Mr. Adams' "Commercial Geography." The one criticism that might be offered of this scholarly work is that the value of the book suffers because it contains no references of places where the general reader may look for further information. A brief bibliography would add immensely to the convenience of the book.

Seen in Germany. By Ray Stannard Baker. With illustrations. New York: McClure, Phillips & Co. \$2.

This is an interesting sketch of German life among all classes. A chapter gives an account of the German workingman—of his daily life, his wife, his food, his problems, and his relations with his government. The German workingman is supposed to work 11 hours a day and often longer, and for his long day receives from one-third to one-half the wages of an American, work-

ing only eight hours of the twenty-four. Mr. Baker states that wages have risen nearly 33 per cent in the last fifteen years, but this gain has been outbalanced by doubling in cost of food. He makes the startling statement that the staples of food actually cost the German more than they do the American; so that he never thinks of buying butter, milk, eggs, or white flour, which the American would consider absolute necessities. The government keeps a fatherly eye over the workingman, sees that his bread is rightly made, and that he makes provision for his old age. The result of this paternal care, in Mr. Baker's judgment, is greater efficiency in work, but not in the mental development of the workman.

The New Basis of Geography. By Jacques W. Redway. New York: The Macmillan Co.

This volume, written by a well-known writer and lecturer on geographic subjects, is designed to give teachers a broad interpretation of geography, more particularly of the "relations between human activities and geographic environment." It emphasizes the fact that "man and nature, man in nature, not man alone, or nature alone, are the true subjects of interest and of study in geography." It is a very suggestive and stimulating book, and is unhesitatingly recommended to all students of geography.

Armenia—Travels and Studies. By H. F. B. Lynch. Two vols. With many colored illustrations and maps. Longmans, Green & Co. \$15.

Mr. Lynch describes two journeys in Armenia, the first extending from August, 1893, to March, 1894, and the second from May to September, 1898. The first volume deals with the Russian provinces, the second with the Turkish. Mr. Lynch describes the commercial prosperity and the obedience to law

which has been the result of the Russian rule. Erivan is an instance of a small and sleepy town springing into a prosperous commercial center under Russian occupation. Unfortunately, however, says Mr. Lynch, the Russian Government has not confined its energies to maintaining public order, but has sought to regulate the Armenian schools, and has thus almost stifled education. "The result is the Armenian must sink his individuality and resign his initiative into Russian hands." In the Turkish provinces conditions are very bad; the Armenian is badgered and tortured by the Kurd, and neither his life, house, or shop is safe.

The volumes present an immense amount of information—geographical, political, and historical. The numerous maps and illustrations are beautifully engraved. An exhaustive bibliography and comprehensive index complete this valuable work.

The Insect Book. By Dr. L. O. Howard. With many illustrations. New York: Doubleday, Page & Co. \$3.

The Insect Book will be prized by the amateur who in spare moments takes delight in making collections and in studying insect life. Dr. Howard has aimed "to encourage the study of life histories of insects," and, wherever possible, gives a typical life history of each family. He tells not only what is known, but also what is not known, but which can be more or less easily found out. The book is handsomely illustrated from photographs of insects.

Europe and the Other Continents. By R. S. Tarr and F. N. McMurry. New York: The Macmillan Co. \$0.75.

Professors Tarr and McMurry are experienced and successful teachers of geography, and are thus able to write a geographic text-book containing the most important facts that a pupil should learn. A special feature of the volume

are 435 colored maps, diagrams, and charts that present in graphic and terse form much information for which there would otherwise be no space. This is the third volume in the series of Tarr and McMurry's Geographies.

The Great Deserts and Forests of North America. By Paul Fountain. Longmans, Green & Co. \$3.75.

The volume consists of a series of rambling but entertaining notes of the author's travels in the western United States, for the most part made some thirty years ago. The title is misleading, for the book is in no sense descriptive of what its name implies.

Australia—The Commonwealth and New Zealand. By Arthur W. José. New York: The Macmillan Co. \$0.40.

The author lived for seventeen years in the four colonies of eastern Australia, and speaks with an intimate knowledge of his subject. In this little volume of 150 pages he gives a summary of the exploration, development, and experiments at self-government in the island continent and in New Zealand.

In the Ice World of the Himalaya. By Fanny Bullock Workman and William Hunter Workman. With maps and illustrations. New York: Cassell & Co. \$4.00.

"In the Ice World of the Himalaya" is the modestly told story of record climbing among the great peaks of the Himalaya. Mrs. Workman is the champion woman mountain-climber of the world, but speaks as modestly of reaching the summit of Koser Gunge, 21,000 feet, or Mount Bullock Workman, 19,450 feet, as though she were walking down Fifth Avenue. As the authors very truly remark, mountain-climbing in the Himalaya is quite different from mountaineering in Switzerland and the Tyrol. Instead of hotels and villages within a few hours distance, and shelter-huts and

a corps of guides, the mountaineer in the Himalaya must march many days beyond even the last semi-civilized village, and then fight his way up the mountain handicapped by coolies whom he must coax and bully along. A number of excellent pictures from photographs give a graphic idea of the great peaks.

The Highlands of Asiatic Turkey. By Earl Percy, M. P. New York: Longmans, Green & Co. \$3.75.

Earl Percy gives the record of a journey in 1899 through Asia Minor from Constantinople to Busra, on the Persian Gulf. Two detail maps of the country are published. There is much information in the volume, but presented in a somewhat heavy manner. There is the usual plaintive chapter appealing to the British Government to wake up and take a definite policy in western Asia.

The Bureau of Forestry has published "Notes on the Red Cedar," by Charles Mohr (Bul. No. 31), and "Practical Forestry in the Southern Appalachians," by Overton W. Price. The former contains a map showing the present distribution of red cedar in the United States. The densest growth of cedar is in Tennessee, west Florida, and central Alabama, while west of the 101st meridian there is none at all. Mr. Price explains the growing need of systematic forest management in the southern Appalachians, and makes a number of practical suggestions.

The great industrial depression in Germany, which has rendered idle more than one-fourth of her workmen, is the subject of a special report by the U. S. consul general at Berlin, Frank H. Mason (Consular Reports, November 9, 1901, No. 1185).

The Chinese protocol, signed September 7, 1901, is published in full in the Consular Reports for November 5 (No. 1180).

NATIONAL GEOGRAPHIC SOCIETY

PROCEEDINGS

MEETINGS OF THE SOCIETY :

November 1, 1901.—Vice-President McGee in the chair.

A paper by Dr. Angelo Heilprin, of Philadelphia, advocating the establishment of a "National Geographic Institute" at Washington, was read by the Secretary. The paper was referred for consideration to a committee consisting of Wm. H. Dall, A. J. Henry, and R. U. Goode. Further notice of the paper will be made later.

Gilbert H. Grosvenor, A. M., gave a brief address on the "Geographic Societies of Europe and America," more particularly of those on the former continent. The Vice-President in an eloquent address explained why the study of geography appeals to the intellect and heart of men.

November 15.—Vice-President McGee in the chair.

Dr. Marcus Baker read a paper on "The Lost Boundary of Texas," an abstract of which appears on page 430 of this Magazine.

LECTURES :

November 8.—Vice-President McGee in the chair.

Dr. F. H. Wines, Assistant Director of the Census, opened the course of lectures presented by the Society this season by an address on "The Twelfth Census." Further notice of this lecture will be made later.

November 22.—Vice-President McGee in the chair.

Mr. Herbert L. Bridgman, Vice-President of the Arctic Club, gave an illustrated address on "Peary's Work and Progress during the Past Two Years." Mr. Bridgman exhibited a map prepared by Peary as a result of his work in 1900, showing in detail the northern coastline of the Greenland Archipelago. The worn character of the north coast, similar in character to the north coast of Grant Land, on the other side of Robeson Channel, showed unmistakably that the northern sea was a vast ocean, probably extending to the Pole itself. The map will not be published until Mr. Peary returns to the United States.

ANNOUNCEMENTS

POPULAR LECTURES :

December 6.—"The Interior of Borneo;" Prof. A. C. Haddon, Oxford, England.

The natives of Borneo were the object of study of an expedition dispatched to the island from England in 1898-1899. As leader of this expedition, Professor Haddon obtained much interesting information about the peoples and country of the little-known interior.

December 20.—"The Trans-Siberian Railway;" Hon. E. J. Hill.

As a member of important committees in the House of Representatives, Mr. Hill has taken a practical interest in the extension of American influence, and has just returned from the Orient over the Trans-Siberian Railway. His journey gave opportunities for observations of much interest, which will receive first announcement through the Society.

January 3, 1902.—"The New Mexico;" Hon. John W. Foster, ex-Secretary of State.

General Foster was United States minister to Mexico during the years 1873-1880, when the Republic was just starting on that phenomenal career of development which raised it to a prominent position among nations and placed its president among the world's great leaders. Twenty years later (in 1901) he revisited the country as its guest, and his observations and impressions will form the theme of his lecture.

January 17.—"American Progress and Prospects in the Philippines;" Gen. A. W. Greely, Chief Signal Officer, U. S. Army.

General Greely has returned to America after an extended tour among the Philippine Islands. As an example of American progress in the Philippines, it may be stated that 6,000 miles of telegraph lines and cables have been put up in these islands by the U. S. Signal Corps in the three years since the capture of Manila. Telegraph and cable connections are now complete between the northern coast of Luzon and Jolo, 1,000 miles to the south.

MEETINGS OF THE SOCIETY :

December 13, 1901.—"The Northwest Boundary;" C. H. Sinclair, U. S. Coast and Geodetic Survey; E. C. Barnard, U. S. Geological Survey; Bailey Willis, U. S. Geological Survey.

December 27.—Holiday vacation.

January 10, 1902.—Annual meeting, reports and elections.

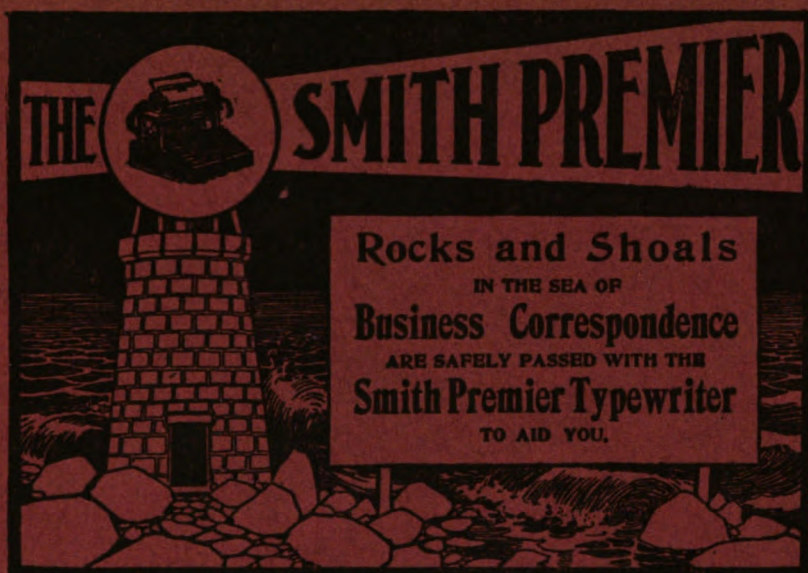
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